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ABSTRACT

This math lab activities booklet accompanies a teacher's management guide and a set of five booklets which comprise the basic curriculum for "Mathematics Laboratories for Disadvantaged Students," a nationally validated Title III ESEA project. The materials in this bulletin are designed to serve as the core of the laboratory curriculum. Over 150 activities that emphasize a variety of skills are included. (RH)

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Laboratory Mathematics

Booklet 8

Math Lab Activities

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SE 022 699

LABORATORY MATHEMATICS

Booklet 8

Math Lab Activities

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A Nationally Validated Project
funded under
Title III, Elementary and Secondary Education Act
1972-77

PREFACE

This math lab activities booklet accompanies a teacher's management guide and a set of five booklets which comprises the basic curriculum for "Mathematics Laboratories" for Disadvantaged Students," a nationally validated Title III ESEA project. The management guide and the series of curriculum booklets were compiled by Mrs. Sandra Rogers who has worked in the mathematics laboratories project for three and one-half years. The math lab activities booklet was compiled by Mrs. Rogers and Mrs. Mary Susan Johnson. Mrs. Johnson served as one of the original project teachers. These teachers were assisted in their effort by Dr. Sam Buckner of Clemson University who served as consultant to the project staff and Mr. Dan Sandel, math consultant in the South Carolina State Department of Education.

Teachers who plan to use the mathematics laboratory methods, as developed in this project, are cautioned to be aware that no one set of curriculum materials can be used with all students. The materials developed in this project should serve as the basic core of the laboratory curriculum with each teacher using his own initiative to adapt the materials to the needs of his students.

Materials and methodology alone will not produce a successful mathematics laboratory program. For success to be realized, the mathematics laboratory must be staffed with a teacher and an aide who are dedicated and enthusiastic and who are compassionate toward the type of students served in this project.

Dr. Marvin Woodson, Jr.
Assistant Superintendent and
Project Director

MATH LAB ACTIVITIES

These activities came from a variety of sources and people that we will not identify. This is in keeping with the philosophy of sharing ideas among mathematics educators as stated at the National Council of Teachers of Mathematics Convention of 1972.

While we have made an effort to categorize these activities, their real value lies in their adaptability.

There are many stimulating games, exciting drills, activities applicable to daily living, and useful manipulatives. Incorporating these into a math program will insure your children an exciting learning opportunity, so roll up your sleeves and have fun.

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1. SET IT UP

Objective: Understand set formation, describe sets, and determine the number of elements in a set.

Materials: Picture magazines, scissors, paper, pencils

Directions:
(1) Find several pictures of the same types of things (pictures of cars, people, animals, etc.).
(2) Cut out enough pictures for at least three groups of things.
(3) Cut a piece of paper into three parts.
(4) Use one piece of paper for each set to describe the set. Write as many words as you can to describe the set.
(5) Count the number of things in each set. Write this number below the words describing each set.
(6) Can you think of other sets you could form? Compare your sets with the sets that your classmates have.

2. OLD MACDONALD'S FARM AND GEOBOARDS

Objective: Understand sets and subsets.

Materials: Geoboard or peg board, multi-colored rubber bands, crayons, ruler

Directions: Old MacDonald had a farm--or so the story goes! Think of this farm as the Universal set. Close everything else out of your mind. Think only of the farm.

(1) Put a red rubber band around all 4 outer rows of pegs on your geoboard. This is the Universal set. Everything that is on Old MacDonald's farm must be inside this "ring". (As a short cut use this sign for the Universal set--U. This is called a symbol.)
(2) Place a yellow band around 6 pegs to represent the buildings on the farm.
(3) Place a green band around 4 pegs to show the trees.
(4) place a blue band around 10 pegs to show the animals.

The yellow, green and blue bands are called subsets of the Universal set. Subsets are a part of the "big" set--U, just as buildings, animals and trees are a part of the farm.

(5) For fun, why not make subsets within the subsets you already have on your board? For example, where would you put bands for ducks, horses, silos, barns, house, oak trees, or dogwood trees? All of these are subsets of the U (Old MacDonald's Farm).

3. SET SWAPPING

Objective: List and describe sets.

Materials: Newspapers, magazines, scissors, paste, paper

Directions:
(1) Cut pictures from newspapers and magazines to form sets.
(2) Paste pictures on paper and list the members of each set.
(3) Swap sets with a partner. List and describe the members of the "new" sets.
(4) Compare the description each partner wrote to see if both are correct.

4. SUBSET SELECTION

Objective: Recognize subsets and empty sets.

Materials: Paper bag, 4 similar objects (crayons, pencils, bottle caps, marbles, etc.)

Directions:
(1) Place 4 similar objects in a paper bag.
(2) Take one object out of the paper bag. This is a subset of the set of objects in the bag. Put the object back. List the object in the set as follows:

A = (white crayon)

(3) Take 2 objects out of the bag. This, too, is a subset. Put both objects back and try again, taking out one or more things. Each time you will have a subset. List these two subsets.

B = (green crayon, yellow crayon) C = (white crayon, green crayon)

(4) Take out all of the objects. This too is a subset.

D = (white crayon, green crayon, yellow crayon, blue crayon)

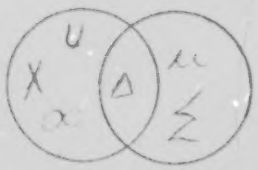
(5) Don't take anything out of the bag. What do you have in your hand? Nothing. Your hand is empty. This is an empty set. This empty set is also a subset. This set is written ( ).

5. SETSECTION

Objective: Find and explain intersection of sets.

Materials: Two pieces of yarn, pencil, eraser, book string, blocks and lists showing objects in Set A and Set B.

Directions:
(1) Form two circles with the pieces of yarn. Place one circle on the left side of the desk, the other on the right side.
(2) If the same object is in both sets, the circles should overlap as follows:



The triangle is a member of both sets. This is called INTERSECTION C.
(3) Using other objects, make up more sets. Put some in A, B, and some in both. Place them again in the circles.
(4) Exchange lists with classmates and place objects in the right sets.
(5) Discuss the sets and their common objects with a classmate.

6. MATCH UP

Objective: Identify equal and equivalent sets.

Materials: Teacher-made cards with words describing a set (apples, oranges, pears, etc.) or with numerals (1, 2, 3, 4, 5, etc.) or with shapes (□ , △ , ○ , etc.).

Group Directions:
(1) Deal cards to each student in the group. Each student should receive the same number of cards.
(2) Each player lays all equal or equivalent sets on the table.
(3) Begin the game with the player on the dealer's right drawing a card from the dealer's hand. If it matches any of the cards in his hand, he puts the set on the table and draws again. If it doesn't, the next player draws from him.
(4) Drawing continues until all have gone out.
(5) The player with the largest number of pairs wins the game.

Individual Directions:
(1) Deal cards to each student in the group. Each student should receive the same number of cards.
(2) Each player lays all equal or equivalent sets on the table.

7. SET ACTIVITY

Objective: Recognize and form the intersection of two sets.

Materials: One inch cubes, felt markers, colored yarn, (optional: overhead projector, transparencies)

Directions:
(1) Take eight one inch cubes and three different colored felt markers and have the students color the cubes as follows: red, yellow, blue, red-yellow, red-blue, blue-yellow, red-yellow-blue, and unpainted.
(2) Form three intersecting circles with pieces of red, yellow, and blue yarn.
(3) Students place the blocks in the intersections of the regions where they belong.

Optional: Use the overhead projector to draw set diagrams and the intersection of sets. This can be very effective using color. For example: A blue circular region and a yellow circular region which overlaps will project green where they overlap and intersect.

8. TARGET NUMBER

Objective: Understand place value

Materials: Prepare cardboard numerals from 0-9.

Directions:
(1) Place the cards face down in a box.
(2) Draw the following on a sheet of paper:

(□□ + □□) - □□ → 50

(3) Draw six digit cards out of the box and write them in the boxes so that the equation is true.
(4) Start over by removing the digit cards and changing the target number.

9. STOCK MARKET

Objective: Identify place value of numbers.

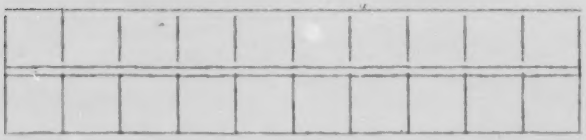
Materials: 1" x 1" squares, popsicle sticks, glue, scissors, construction paper, 10" x 10" squares, playing boards (see below)

100's	10's	1's

Directions:

(1) Cut 1" x 1" squares from construction paper to represent the ones unit.

(2) For the tens place cut several rectangular pieces of construction paper long enough to cover a popsicle stick. Divide this rectangle into 10 units to represent the tens column. See illustration.



-----fold line

Each popsicle stick when it is covered as directed above represents the value of 10. (Ten small squares are equal to one popsicle stick.)

(3) Cut several 10" x 10" squares to represent the value of 100.

(4) As each student rolls the dice he is given that number of squares. (If he rolls 12, he is given 12 squares.) Before the next student rolls the dice, the first player must trade in the small units for as many of the larger units as possible.

(5) At the end of ten rolls, each student should have made all possible trades and should have the least possible place value pieces on his playing board.

(6) To extend this activity include larger place values.

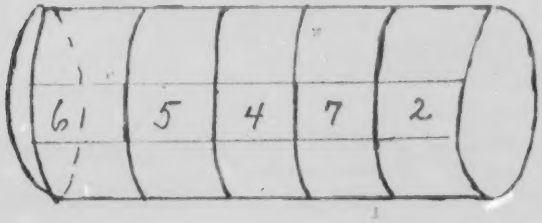
10. WIZARD OF OZ

Objective: Identify the place value of a number.

Materials: Small cans with both ends removed, scissors, tape, 3" x 5" cards, 1/2" vertical strips of numbers.

Directions:

(1) Prepare an OJ meter for each player by taping 5 or more vertical strips of numbers around the label area of the can leaving each loop loose enough to slide easily around the can.



OJ Meters work like a mileage indicator on a car.

(2) Prepare instruction cards to state such things as:

Add a point if the number in the 10's place value is less than 5	Lose a point if your number is odd.	Lose a point if 1000's digit is even.

(3) Each player sets a number on his OJ meter before an instruction card is drawn from the deck of cards.

(4) One player draws a card from the top of the deck of cards and places this card face up where all players can see it. Each student wins or loses points for each draw.

(5) Next player in turn draws from the cards for the next round.

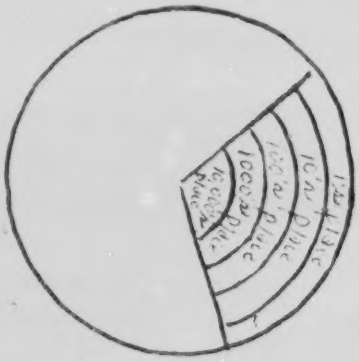
(6) The first player to teach ten points wins the game.

(7) To modify the game somewhat add a decimal column on the OJ meter and appropriate instructions within the deck of playing cards.

11. PLACE-VALUE WHEEL

Objective: Understand face value and place value in 4 digit numbers. (Face value-the meaning it has wherever used; Place value-the meaning it takes from its place)

Materials: Place value wheel made from construction paper. Each place will have a different color of paper.



Place numerals on each circle of the wheel in such a manner that numerals on different circles can be aligned.

Directions:
(1) Dial a numeral on the wheel and tell the place value meaning of the numeral.
(2) Dial a different numeral to repeat the process.

(This activity can be extended to use decimals.)

12. BUTTON THROW

Objective: Understand place value.

Materials: Nine buttons per student, 5 tin cans (each representing a different color), 5 pieces of construction paper to match can colors. (each color is assigned a place value).

Directions:
(1) Place the five cans in a group
(2) Students toss buttons trying to get them into the cans. (Students should be close enough to score but not so close as to be able to selectively drop the buttons into a desired can.)
(3) After all buttons have been tossed by a particular student, he will place the number of buttons in each can on the corresponding color paper. Empty cans represent zero's.
(4) Each student playing Button Throw repeats Step Three until all buttons have been tossed.

Variations:
(1) Student may total several tosses to practice regrouping.
(2) Various bases can be used, limiting the number of buttons as indicated by the selected base until competence has been achieved.

13 MATCH'EM

Objective: Understand place-value, compact numerals, and the abacus.

Materials: Index cards, abacus (optional)

Directions:
(1) Students write on numeral on an assigned number of cards.
(2) On other cards, students must draw a picture of an abacus for numerals written on the assigned cards.
(3) Stack the cards with numerals in one group. Stack the cards with a picture of an abacus in another group.
(4) Shuffle the cards in each group to rearrange them.
(5) Turn over a card with a picture of an abacus. Find its match. The student who finds the match first "holds" the matched pair.
(6) The winner is the student with the most matched pairs.

14. CARD INEQUALITIES

Objective: Use relation symbols $<$, $>$ and $=$ involving fractional numbers.

Materials: Twenty-five cards with 2 fractions written on each card (leave enough space between the 2 fractions to place a "$<$", "$>$" card between them), a set of "$<$" + "$>$" cards (these should be smaller than the numeral cards). The following illustrates the two different types of cards:

Directions:
(1) Place all cards face down on the table.
(2) Students turn one card up at a time going clockwise around the table.
(3) Each player selects the correct symbol for his card and places it between the fractions. If he is correct the play passes to the next player. If incorrect, the player who notices the error first gets the play.
(4) Five points are given for each correct card. A score of 100 wins the game.

15. THE NUMBER LINE

Objective: Identify the missing number in a sequence of consecutive numbers.

Materials: "Counto" playing cards, bottle tops, one "counto" master card.

Directions:
(1) Prepare a master card as follows:

12-10	21-19	33-31	52-50	65-63	89-87
15-13	23-21	31-29	56-54	78-76	96-94
4-2	25-23	39-37	55-53	71-69	81-79
5-3	24-22	34-32	64-62	88-86	90-88
6-4	18-16	44-42	58-56	76-74	86-64
8-6	27-25	36-34	FREE 67-65	66-64	91-89
9-7	28-26	35-33	57-55	77-75	84-82
2-0	29-27	40-38	54-52	66-64	82-80
11-9	22-20	41-39	59-57	61-59	100-98
7-5	20-18	42-40	60-58	62-60	85-83
3-1	30-28	48-46	51-49	74-72	94-92
14-12	19-17	45-43	62-60	65-63	87-85

(2) Prepare student cards as follows:

13	22	38	51	70	88
8	28	43	61	60	90
2	20	FREE		77	83
5	21	40	55	65	81
1	17	33	53	73	99
11	18	41	63	64	85

3. Give each student a "Counto" card and several bottle caps.

4. Explain that the rules are exactly the same as Bingo.

5. Let the student who wins be the caller for the next game.

16. MATCH GAME

Objective: Understand place value.

Materials: Set of numer cards and set of matching place value cards.
Example:

10	1 ten 0 ones

Directions:
(1) Shuffle cards and spread out on a table with numbers and words face down.
(2) The first player turns over 2 cards. If they match, he takes the cards for one "trick" and gets another turn. If the cards do not match, he turns them face down on the table in their original positions. (Matching cards are cards of the same value.)
(3) Players continue turning over pairs of cards until there are no more tricks to be made. The player with the most tricks wins the game.

17. EXPANDING

Objective: Understand place value.

Materials: Word cards and number cards.

Example of word card:

Four hundred and three	403

Front side Back side

Example of number cards:

400	3

Directions:
(1) Place the word cards with the words face up on the table.
(2) Place the number cards in separate piles according to place value.
(3) The first player selects one of the word cards and then selects numerals from the separate piles to build the numbers named. Players alternate taking turns.
(4) Activity ends when all numerals have been expanded.
(5) Players may check their solution with the number on the back of the word cards.
(6) The player who has the greatest number of correct solutions wins the game.

18. WHEN IN ROME

Objective: Recognize and write Roman numerals 1-10.

Materials: A fish bowl with twenty "fish" inside. (Mark ten "fish" with the Roman numerals I-X. Mark ten fish with the numerals 1-10.) scissors, magic marker, construction paper.

Directions:
(1) Students take turns taking the twenty fish from the bowl and matching them.
(2) After all have been matched, students can make their own "fish." Scissors and construction paper should be provided so that the students can make at least 4 new pairs.

19. TOTAL (NOT A BREAKFAST FOOD!)

Objective: Understand addition of whole numbers.

Materials: dice, 6-8 sets of digit cards 0-9

Directions:
(1) Divide the class into groups of four or five.
(2) Each group should receive at least ten cards of each of the digits 0 to 9 and one pair of dice.
(3) As each student rolls the dice he should lay aside the digit cards to represent the number thrown on the dice. (One die can represent the ten's numeral and the other can represent the one's numeral or the sum of the dice can be used.)
(4) On each student's second roll, cards representing the number on the dice are assembled. The numbers on both sets of cards are to be added.
(5) Once the group approves that the addition was performed correctly the player can turn in the numbers used to find the sum.
(6) This process is repeated by each player until someone's total is greater than 50, 75, or 100. (Set a total sum according to the ability of the group.

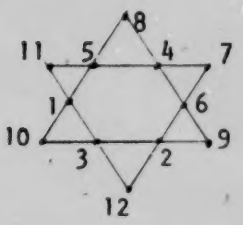
20. MAGIC FIGURES

Objective: Addition of whole numbers.

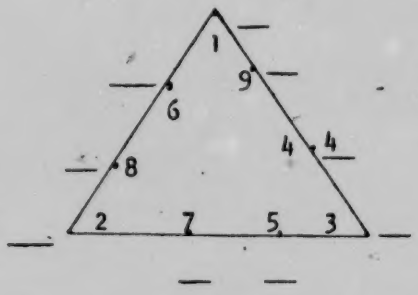
Materials: Construction paper

Directions: A magic figure is one in which all numbers horizontally or vertically add to the same total.

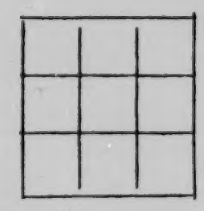
(1) Prepare the magic figures for the students on construction paper or heavy cards.
(2) Ask the students to find 3 ways in which the star figure is magic.
(3) Ask the students to use numbers 0-9 only once as they place them in the blanks beside the magic triangle. Each side should be equal.
(4) Ask students to fill in the nine spaces in the square using each numbers 1 through 9 only once, to make a magic square which totals 15 when added in any direction.



Magic Star



Magic Triangle



Magic Square

(Answers to Magic Square)
4, 9, 2
3, 5, 7
8, 1, 6

21. RIBBON ARITHMETIC

Objective: Understand how to complete equations.

Materials: Paper clips, scissors, red, blue, green, and yellow strips of construction paper ("ribbons")

Directions:

(1) Give each student the following: 2 red ribbons, 1 blue ribbon, 1 green ribbon, and 1 yellow ribbon.

(2) Ask students to join 1 red ribbon and 1 blue ribbon with a paper clip and complete the following equations: 1 + ___ = ___.

(3) Ask students to take the 1 red ribbon away and complete the following equation: 2 - 1 = ____.

(4) Ask students to join 2 red ribbons + 1 green ribbon with a clip and complete the following equations: 2 + 1 = ___; 3 - 2 = ___.

(5) Ask students to join 2 red ribbons, 1 blue ribbon, and 1 green ribbon with a clip and complete the following equation: 2 + 1 + 1 = ___; 4 - 2 = ___.

(6) Ask students to join all the ribbons with a clip and complete the following equations: 2 + 1 + 1 + 1 = ___ ; 5 - 4 = ___.

22. CROSS-NUMBER PUZZLES

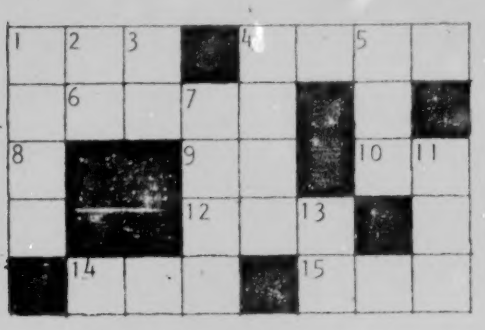
Objective: Understand addition of whole numbers

Materials: Cross-number puzzle

Directions:

(1) Prepare a puzzle card such as the following:

(2) Let students fill in the numbers figuring across and down.



Across:

1. 28 + 87 + 133 + 42 + 142
4. 1327 + 1327
6. 587 + 932 + 857 + 265
8. 5 + 1
9. 12 + 9 + 7
10. 20 + 2 + 15
12. 84 + 96 + 252 + 181 + 128
14. 126 + 42 + 24 + 18 + 20 + 12 + 10
15. 123 + 98 + 201 + 36

Down:

2. 18 + 14
3. 3 + 7 + 8 + 4 + 1 + 3
4. 1024 + 1024 + 136
5. 47 + 83 + 97 + 184 + 67 + 45
7. 2136 + 1068 + 534 + 267 + 267
8. 17 + 32 + 10 + 9
11. 252 + 183 + 197 + 116
12. 12 + 2

23. GO FISHING WITH ADDITION

Objective: Learn basic addition facts.

Materials: Seventy-six count cards (3" x 4"). Print a number name twice on each card such as:

Directions:
(1) Make count cards for the following pairs of numbers:

2 + 9	2 + 6	7 + 1	9 + 6	0 + 4	2 + 1	0 + 7	4 + 4
3 + 8	7 + 4	6 + 3	1 + 2	3 + 0	3 + 6	5 + 4	6 + 0
4 + 7	0 + 3	5 + 6	4 + 3	3 + 9	6 + 1	5 + 2	4 + 1
3 + 3	3 + 4	4 + 8	5 + 7	2 + 5	4 + 2	8 + 4	2 + 3
6 + 5	7 + 5	1 + 6	9 + 5	6 + 6	7 + 2	6 + 8	7 + 7
1 + 9	9 + 0	8 + 6	1 + 8	3 + 2	6 + 4	0 + 5	3 + 7
8 + 2	1 + 5	2 + 8	9 + 3	7 + 8	2 + 2	7 + 5	3 + 1
5 + 3	4 + 5	7 + 3	5 + 5	4 + 9	2 + 7	5 + 8	8 + 5
6 + 9	0 + 8	10 + 2	4 + 6	8 + 3	6 + 2	3 + 5	7 + 0

(2) Shuffle the cards and deal out 8 cards to each player. Put the rest of the cards face down on the table.
(3) Students take turns asking someone for a card that matches on in their hand. If that player has the card, he must give it to the player who requested it. If he doen't have it, he will say "fish". Then you pick the top card from the pack on the table, and the next person takes a turn asking for numbers.
(4) To "fish" the player requesting the card picks the top card from the stack on the table.
(5) The next player starts his turn and follows the same procedure.

24. MATCH GAME

Objective: Learn basic addition facts.

Materials: Small box, 9 colored cards with a numeral on each one; 45 white cards with an addition problem printed on each one.

Directions:
(1) Shuffle white cards and deal out to players. Leave colored cards in the box.
(2) The player on the dealer's right picks a colored card from the box and places it face up.
(3) All players who have white cards with names which match the colored cards must place them on the table.
(4) The next player chooses a colored card to repeat the process.
(5) The player to lay all cards on the table first is the winner.

25. PALINDROMES

Objective: Add whole numbers.

Materials: None

Directions:

(1) Show students how to find a "palindromes" sum by using the following example:

$$\begin{array}{r} 165 \\ +561 \\ \hline 726 \\ +627 \\ \hline 1353 \\ +3531 \\ \hline 4884 \end{array}$$

A palindrome is a sum that reads the same from either end. Thus, in the example, the answer can be read the same from either end.

(2) Have the students to find the palindrome sums for the following numbers: 158, 356, 174, 570, 739, 98, 196, 295

26. THREE IN A ROW MAKES 12

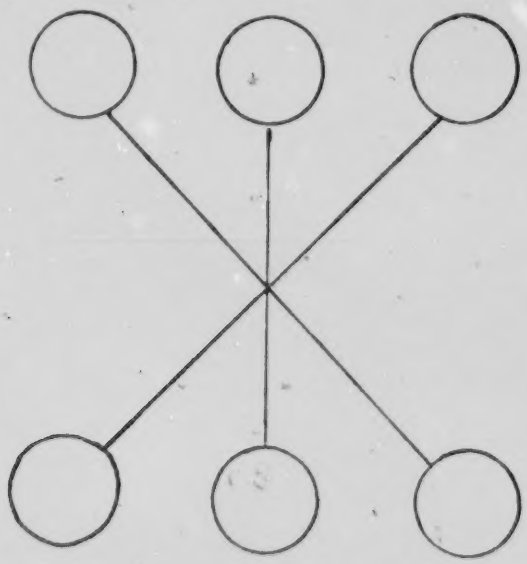
Objective: Understand addition of whole numbers.

Materials: None

Directions:

(1) Mimeograph a figure similar to the one below so that each student can play this game independently.

(2) Instruct the students to put the numbers 1-7 in the 7 circles in such a way that the numbers in each row add up to 12. A row can be vertical, horizontal, or diagonal.



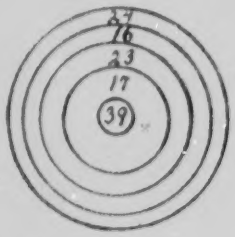
27. BULL'S EYE

Objective: Understand addition of whole numbers.

Materials: None

Directions:
(1) Have students solve the following problem:

An archer was practicing with his bow and arrow on the target shown below. Six arrows completely missed the target but he still made a score of 100. Where did his shots land?

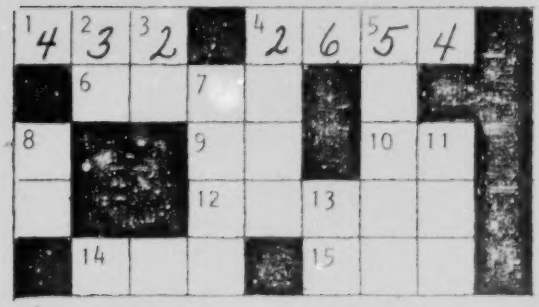


28. CROSSNUMBER PUZZLE

Objective: Understand addition of whole numbers.

Materials: Crossnumber Puzzle (shown below).

Directions:
(1) Give crossnumber puzzles to students.
(2) Ask students to fill in the addends to the sums that are listed.
(3) When students have completed the missing numbers they can enter the sums in the puzzle.



Across

1. ___ + ___ + ___ = 432
4. ___ + ___ = 2654
6. ___ + ___ + ___ = 2641
8. ___ + ___ + ___ = 6
9. ___ + ___ = 28
10. ___ + ___ + ___ = 37
12. ___ + ___ = 741
14. ___ + ___ + ___ + ___ = 252
15. ___ + ___ + ___ + ___ + ___ = 458

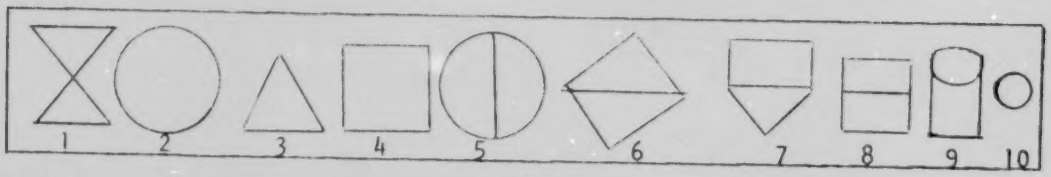
Down

2. ___ + ___ + ___ = 32
3. ___ + ___ + ___ = 26
4. ___ + ___ + ___ = 523
5. ___ + ___ + ___ = 523
7. ___ + ___ = 4272
8. ___ + ___ + ___ = 68
11. ___ + ___ = 748
13. ___ + ___ + ___ + ___ = 14

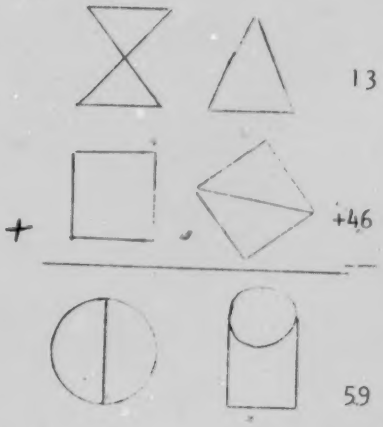
29. Code Addition

Objective: Understand addition of whole numbers.

Materials: Copy of symbols printed below.



Directions:
(1) Help students to understand the code for each number.
(2) Direct the students to prepare 20 addition problems using the code. They must answer their problem in code and in numbers as well.
(3) The following may help to serve as examples:

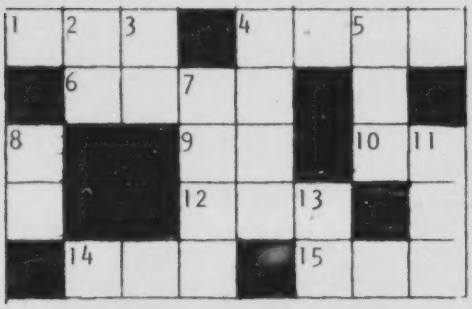


30. CROSS-NUMBER PUZZLE

Objective: Understand addition of whole numbers.

Materials: Crossnumber puzzle

Directions:
(1) Provide the following crossnumber puzzle.
(2) Instruct the students to solve the problems and place the sum in the puzzle.



Across

1. 28 + 87 + 133 + 42 + 142
4. 1327 + 1327
6. 587 + 932 + 857 + 265
8. 5 + 1
9. 12 + 9 + 7
10. 30 + 6 + 1
12. 84 + 96 + 252 + 181 + 128
14. 126 + 42 + 18 + 20 + 12 + 10
15. 123 + 98 + 201 + 36

Down

2. 18 + 14
3. 9 + 7 + 5 + 3 + 2
4. 1024 + 1024 + 136
5. 47 + 83 + 97 + 184 + 67 + 45
7. 2136 + 1068 + 534 + 267 + 267
8. 17 + 32 + 10 + 9
11. 252 + 183 + 197 + 116
13. 10 + 4

31. MAGIC SQUARE OF 111

Objective: Understand addition of whole numbers.

Materials: None

Directions:
(1) Provide magic squares such as the one below.
(2) Explain that the magic square contains 36 small squares. The numbers 1-36 should be placed in the boxes so that the sum in each row, each column, and each diagonal is 111.

35			26		
		7		23	
	9			27	
		33			15
	5		12		
4					11

32. WHAT'S YOUR AGE?

Objective: Understand addition of whole numbers.

Materials: Chart (see below)

Directions:

(1) Let students work in pairs. Give one student a copy of the chart below.

(2) Give the student who has the chart the following directions:
   (a) Ask your partner to think of a number and then tell you in which columns the number appears. (For example: he may tell you his number appears in Columns A, C, D, and E.)
   (b) Add the top number in each column in which he said his number appeared (1 + 4 + 8 + 16 = 29). His secret number was 29.

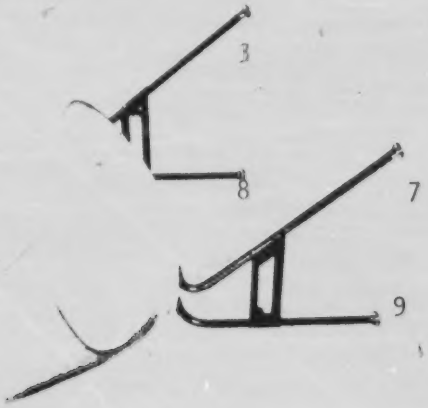
A	B	C	D	E	F
1	2	4	8	16	32
3	3	5	9	17	33
5	6	6	10	18	34
7	7	7	11	19	35
9	10	12	12	20	37
11	11	13	13	21	37
13	14	14	14	22	38
15	15	15	15	23	39
17	18	20	24	24	40
19	19	21	25	25	41
21	22	22	26	26	42
23	23	23	27	27	43
25	26	28	28	28	44
27	27	29	29	29	45
29	30	30	30	30	46
31	31	31	31	31	47
33	34	36	40	48	48
35	35	37	41	49	49
37	38	38	42	50	50
39	39	39	43	51	51
41	42	44	44	52	52
43	43	45	45	53	53
45	46	46	46	54	54
47	47	47	47	55	55
49	50	52	56	56	56
51	51	53	57	57	57
53	54	54	58	58	58
55	55	55	59	59	59
57	58	60	60	60	60
59	59	61	61	61	61
61	62	62	62	62	62
63	63	63	63	63	63

33. CHAIR RING TOSS

Objective: Understand addition of whole numbers.

Materials: Chair, 4 large plastic rings

Directions:
(1) Turn a chair upside down on the floor.
(2) Tape a number to each leg of the chair.
(3) Six feet from the chair draw a chalk line on the floor.
(4) Students stand behind the chalk line and take turns throwing the 4 rings at the upturned legs.
(5) When a student completes his turn he must add the number on each leg for his score.
(6) The player with the highest score after a predetermined number of throws is the winner.



34. MUFFIN PAN TOSS

Objective: Understand addition of whole numbers.

Materials: Muffin pan, small rubber erasers

Directions:
(1) Tape a number in the bottom of each cup of the muffin pan.
(2) Place the muffin pan on the floor.
(3) About 4 feet from the pan, draw a chalk line on the floor.
(4) Have students toss a small rubber eraser at the pan. The number in the cup where your eraser lands is the score.
(5) Students write the scores on a piece of paper.
(6) At the end of the playing time, the person with the highest score is the winner.

35. ROLL A NUMBER

Objective: Learn basic addition and multiplication skills.

Materials: Two cubes painted with dots to resemble dice, paper, pencils

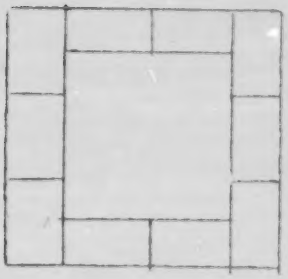
Directions:
(1) Let students sit on the floor to play this game.
(2) A leader should roll the cubes.
(3) The student who first adds (or multiplies) the dots becomes the leader.
(4) Students should keep a record of the rolls they were able to answer.
(5) The student who is the leader the most number of times (or who has the largest correct number of rolls recorded on paper) is the winner.

36. THE 18 CARD SQUARE PUZZLE

Objective: Understand addition of whole numbers.

Materials: Playing cards

Directions:
(1) Students take 10 cards from a pack of cards, beginning with the ace through 10.
(2) Students arrange the cards in a square such as the one shown so that each side has a sum of 18.
(3) Students can sketch a drawing of their square to show that each side has a sum of 18.



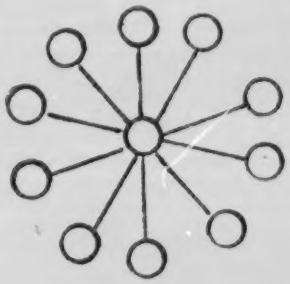
37. ADDING TO EIGHTEEN

Objective: Understand addition of whole numbers.

Materials: Diagrams of figure below

Directions:

(1) Give each student a diagram of the figure.
(2) Instruct them to place numbers 1-11 in the 11 circles so that every 3 numbers in a straight line will have a sum of 18.



38. MAGIC SQUARE OF 65

Objective: Understand addition of whole numbers

Materials: Magic Square (see below)

Directions:
(1) Provide each student with a magic square as shown.
(2) Instruct students to place the numbers 1-25 in the small squares so that each row, each column, and each diagonal has a sum of 65.

			8	
23				16
		13		
	12			
			2	9

39. HOG

Objective: Understand addition of whole numbers

Materials: Dice, three letter cards (one with an H on it, another O, and another G)

Directions:

(1) Explain to the students that the object of "Hog" is to be the first one to roll numbers which have a sum of 100 or above.
(2) A player who rolls 7 does not score and must pass the dice on to the next player. The player who rolls two ones must pass the dice and, in addition, loses all points gained thus far. His score automatically becomes zero if he throws a pair of ones.
(3) Each player rolls the dice at least one time before passing the dice to the next player. A player has two choices: he can continue rolling the dice and adding to his score or he can pass the dice on while his luck is holding.
(4) Players continue to roll the dice and take turns until someone's score is 100 or above.
(5) When someone scores 100 or above, the other players have one roll of the dice to try to get a better score.
(6) After each student has the final roll, the one with the highest number wins a letter.
(7) The first player to have the word HOG is the winner.

40. ADD WITH 0--TAKE AWAY WITH 0

Objective: To give concrete ideas of adding or subtracting with zero or empty set. To go from concrete ideas to abstract ideas of the same operations and work equations.

Materials: Buttons, paper clips, crayons, small empty box

Directions:

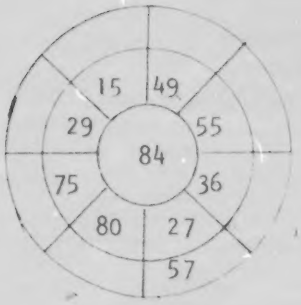
(1) Give to each pupil a copy of the directions below, buttons, paper clips, crayons, and a small empty box. Take everything out of the box. (When there is nothing in a box, it is an empty box. When there are no objects in a set, it is an empty set. The number name for the empty set is zero. The numeral for zero is written 0.)
(2) Put 5 buttons in the empty box. How many in all do you have?_____
$5 + 0 = ___$
(3) Take none of the buttons out of the box. How many do you have left?__
$5 - 0 = ___$
(4) Put 8 paper clips in the empty box. How many objects do you have in the box?____
(5) Take none of the clips out of the box. How many do you have left?__
$8 - 0 = ___$
(6) Put 4 crayons in the empty box. How many do you have in all?____
(7) Take none of the crayons out of the box. How many do you have left?___
$4 - 0 = ___$

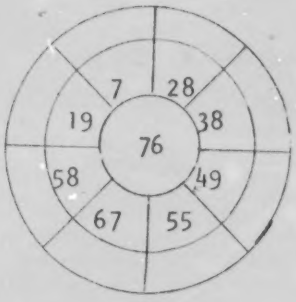
41. WHEELING AND DEALING

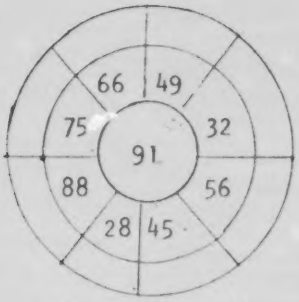
Objective: Subtraction of whole numbers with renaming.

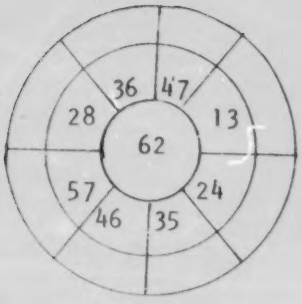
Materials: Ice cream spoons, mimeographed copies of the wheels

Directions:
(1) Make mimeographed copies of the wheels
(2) Distribute wheels to students with directions to fill in the blanks on each wheel by subtracting the numbers in the inner ring from the one in the center.
(3) Students may use spoons to help in subtracting.









42. THE NOMOGRAPH

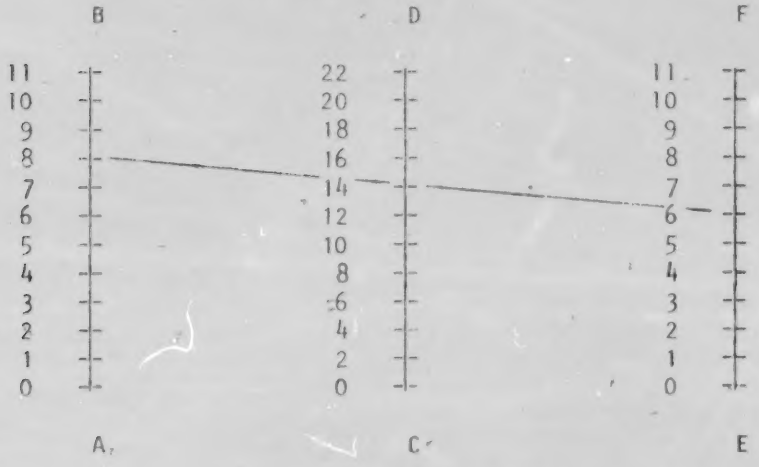
Objective: The student will be able to add and subtract using the nomograph.

Materials: Index cards for students

Directions:

(1) Construct a nomograph by drawing 3 equidistant parallel line segments of equal length.

(2) The numbers on line segments AB and EF should be the same. The number scale on line segment CD should be twice the corresponding number. See the example below:



(3) To add numbers such as 8 and 6 students should be directed to place a straight edge on AB at 8 and on EF at 6. The sum can be found where the edge crosses CD at 14 (8 + 6 = 14).

(4) Prepare addition problems which can be solved by using the nomograph.

(5) Students can also use the nomograph to subtract. If 5 + 3 = 8, then 8 - 3 = 5 and 8 - 5 = 3. By placing straight edge at 8 on CD and at 5 on AB, the edge crosses EF at 3.

(6) Prepare subtraction problems which can be solved by using the nomograph.

43. RIVER TO RIVER

Objective: Understand subtraction of whole numbers.

Materials: Pencil, paper, World Almanac, crown or special hat

Directions:

(1) Direct students to find the difference in length between the Amazon River (3900 miles long) and the Yangtze (3400 miles); Congo (2718 miles); Rio Grande (1885 miles); and Ganges (1560 miles).

(2) The first student to find the correct answers gets to go to the Almanac to select five more rivers. He is called the "River King" or "River Queen." The object is to remove him/her from the throne.

44. BEAN BAG GAME

Objective: Understand addition and subtraction of whole numbers.

Materials: Two bean bags, a court 3' by 3' divided into nine numbered squares. Numbers in the squares may vary. The distance varies according to skills of the children.

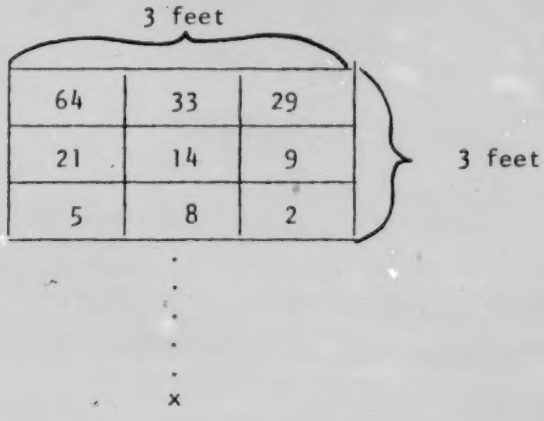
Directions:

(1) The first player stands on X and tosses the 2 bean bags, one at a time, onto the court. His score is the sum of the numbers of the two squares in which the bean bags land. If a bag lands on a line, he uses the smaller of the 2 numbers. If either bean bag lands outside the court, he get no score for the round.

(2) Each player takes a turn. Play continues for 5 rounds. The winner is the player with the highest cummulative score.

(3) The game can be varied by subtracting instead of adding the two numbers each time. The student with the lowest cummulative score is the winner.

(4) Another variation of the game is to add the score for the odd-numbered rounds, subtract the even-numbered rounds, and then add all five scores. The winner is the player with the highest cummulative score.



45. ROLL 'EM

Objective: Understand addition and subtraction of whole numbers.

Materials: 3 wooden cubes

Directions: Roll 3 cubes. Call out sum or difference if + or - sign is showing. Call out true or false if = sign is showing.

(1) Prepare two cubes by writing the numerals 1-6 on them. The third cube should have "+" on two sides, "-" on two sides, and "=" on two sides.

(2) Students roll the three cubes. They should give the sum or difference if the "+" or "-" sign is showing. They should call true or false if the "=" is showing.

46. TRAVELING WITH WHOLE NUMBERS

Objective: Understand addition and subtraction of whole numbers.

Materials: Road maps

Directions:

(1) Direct students to use a road map to find the distance between cities in South Carolina. They should use the mileage code to find the approximate distances between the following cities:

(a) From Columbia to Myrtle Beach, it is ____ miles.
(b) From Charleston to Myrtle Beach, it is ____ miles.
(c) From Spartanburg to Conway, it is _____miles.
(d) From Georgetown to Lexington, it is _____miles.
(e) From Anderson to Columbia, it is _____miles.
(f) From Honea Path to Sumter, it is _____miles.

(2) Ask students to tell how far it would be to travel from:

(a) Myrtle Beach to Spartanburg and back to Conway.
(b) Charleston to Greenville and back to Honea Path.
(c) Georgetown to Belton and back to Laurens.
(d) Lexington to Anderson and back to Sumter.

47. BOWLING SUBTRACTION

Objective: Understand subtraction of whole numbers.

Materials: 10 small match boxes, marbles, paper, pencil

Directions:
(1) Each group sets up the pins (match boxes) and takes turns rolling the ball (marble).
(2) If the student starts with the 10 pins and 3 are knocked down, he writes 10 - 3 = 7. The student rolls again and writes the new problems until all pins are knocked down.
(3) Let students exchange "score cards" to check subtraction.

48. MULTIPLICATION IS ADDITION?

Objective: Understand multiplication of whole numbers.

Materials: Dice, about forty small cubes per group of players

Directions:
(1) Each player rolls the dice and fills in the chart below:

Groups	Cubes in each group	Total cubes
4	3	12

In this example the student rolled a 4 on the first die, and a 3 on the second. The student should use his cubes to make 4 groups of 3 each for a total of 12 cubes.
(2) The student with the largest number in the total column is the winner of this competition.

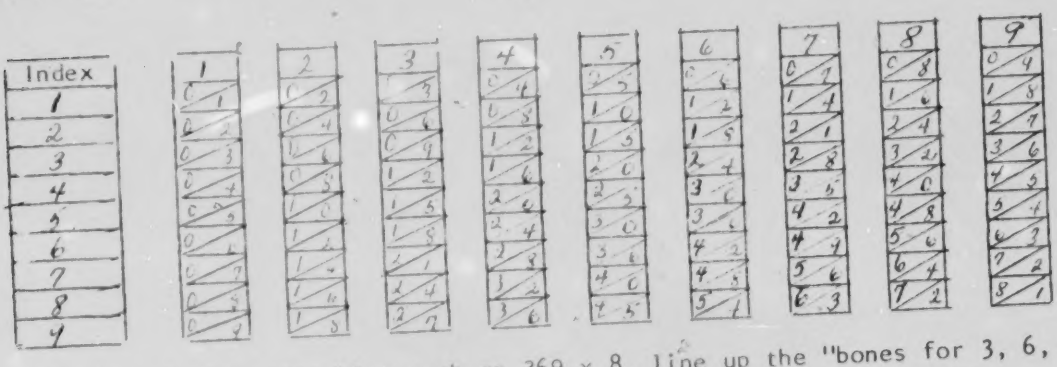
49. NAPIER'S BONES

Objective: Understand multiplication of whole numbers.

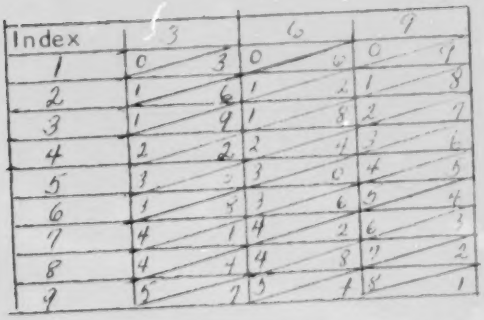
Materials: 3 x 5 index cards

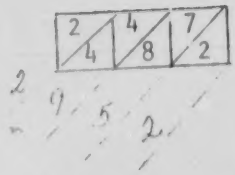
Directions: A few hundred years ago, a mathematician named John Napier (1550-1617) invented a calculating device. This device was a set of rods carved of bone and often referred to as Napier's Bones.

(1) To make Napier's calculating device, take index cards and cut out nine strips, each about 1/2 inch wide and 10 spaces long.
(2) Write a different digit from 1 through 9 at the top of each one.
(3) List the multiples from 1 to 9 on each strip (see examples).
(4) Make one index strip.



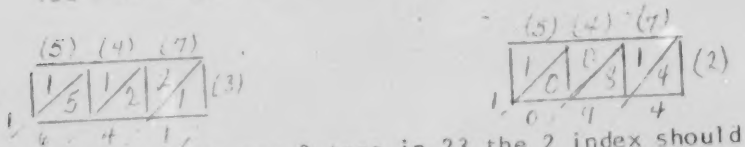
(5) To multiply a problem such as 369 x 8, line up the "bones for 3, 6, 9 and index as shown and add the numbers in each diagnoal column. (Use the rule for carrying.)





The answer is 2952

(6) To multiply a problem such as 547 x 23, use the following steps:
(a) Line up the 5, 4, and 7 strips with the index. Find the horizontal column corresponding to the 3 and the 2 on the index. You should get the following after adding diagonally.



(b) Because there are 2 tens in 23 the 2 index should be thought of as 20. A zero is placed to the right of 1094. These "answers" should be added together as in a regular multiplication problem.

```
 1641
+1094
-----
12581
```

50. FENCING MRS. ROBINSON'S BACKYARD

Objective: Understand addition and multiplication of whole numbers

Materials: Any large department store catalog

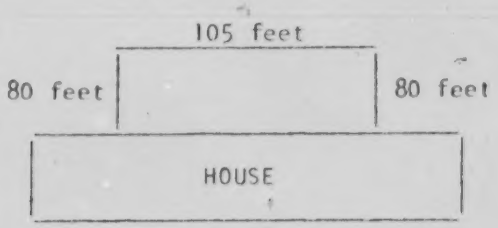
Directions:

(1) Present the following problem to a group of students so that they can help Mrs. Robinson solve her problem. Mrs. Robinson needs a fence around her back yard so that her children, Joy and Jeff, can play without going to the road. The yard is 80 feet long and 105 feet wide.

(2) Fill in the catalogue order blank to give the total cost of the fencing job of the following items:
   (a) 48 inch high chain link fencing
   (b) fence posts for end, gate, corner posts
   (c) acorn caps for corner, end, and gate posts
   (d) loop caps for middle fence posts
   (e) steel top rails
   (f) tie wires every three feet
   (g) pail end bands for end, corner, and gate posts
   (h) pail end fittings for end, corner, and gate posts
   (i) tension bands and tension bars
   (j) one single walk gate
   (k) one double drive gate
   (l) drop fork latch for each gate
   (m) post hole digger.

(3) Students will also need 2 bags of cement at $4.00 a bag and someone to dig the post holes for 35¢ a hole. The holes should be spaced 10 feet apart.

Note: The fence will only have 3 sides since it will connect with the house on one end.



51. MYSTERY MULTIPLICATION

Objective: Understand multiplication of whole numbers.

Materials: None

Directions:
(1) Give the brain teaser below to students. In the problem only 5 figures are shown. The rest are indicated by x's.
(2) By reasoning it is possible for students to complete all other figures in the problem. Tell students that the numeral 7 does not appear anywhere in the problem.

```
  2XX
  3XX
  5XX
 X4X
XX3
-----
XXXXX
```

52. WONDERBALL

Objective: Learn basic multiplication facts.

Materials: Playground ball, timer

Directions:
(1) Form a circle with the students standing or sitting.
(2) At a signal start the timer for one minute and have the students pass the ball around clockwise.
(3) As each student gets the ball he must say a multiplication fact. For example, the first student may say "1 x 1 = 1". The next student must say, "1 x 2 = 2." The next student must say "1 x 3 = 3" and so forth.
(4) The person holding the ball when the timer goes off receives a penalty point.
(5) Reset the timer and continue the game.
(6) The winner is the person with the fewest points.
(7) To modify the game, the student must bounce the ball once, state his multiplication facts, and then pass the ball on to the next player.

53. GUESSING BIRTHDAYS WITH AMAZING PRECISION

Objective: Understand basic addition, subtraction, and multiplication facts.

Materials: None

Directions:

(1) Have students work in pairs. One student should be given the following information in order to guess the other's birthday:

(a) Ask your partner to write the month and day of his birthday. For example: 1/15 means January 15. Do not look at what he writes.

(b) Ask your partner to multiply the month by 5, then add 6. Multiply that answer by 4 and then add 9. Multiply by 5.

$$\begin{array}{r} 1 \\ \times 5 \\ \hline 5 \\ +6 \\ \hline 11 \\ \times 4 \\ \hline 44 \\ +9 \\ \hline 53 \\ \times 5 \\ \hline 265 \end{array}$$

(c) Ask your partner to now add the day of his birth to the the total above.

$$\begin{array}{r} 265 \\ +15 \\ \hline 280 \end{array}$$

(d) You should ask your partner what his final answer was (280). Having this number will enable you to tell your partner his birthdate. First subtract 165 from the total he give you.

$$\begin{array}{r} 280 \\ -165 \\ \hline 115 \end{array}$$

The last two numbers will be the date of his birth. The first number will be the month in which he was born.

54. MULTIPLICATION

Objective: Learn basic multiplication facts.

Materials: None

Directions:
(1) Write the following poem on the board.
(2) Have students complete the poem by filling in the blanks and adding the 9 x 9, 9 x 10, 9 x 11, and 9 x 12 verses.

When you drive
Don't cross the line
9 x 1 equals ___.

Greetings, greetings
To the Dean
9 x 2 will be ___.

Eating ice cream
This is heaven
9 x 3 is ___.

Go to the movies
To watch the flicks
9 x 4 is ___.

Swim, swim
Take a dive
9 x 5 is ___.

Dance, dance,
Out on the floor.
9 x 6 is ___.

Sailor's boats
Are on the sea.
9 x 7 is ___.

My bonnet and
my shoes are new
9 x 8 is ___.

55. MULTIPLICATION BEE

Objective: Learn basic multiplication facts.

Materials: Multiplication flash cards

Directions:
(1) Divide the students into 2 groups.
(2) Show the first student a flash card. If he can give the correct answer to the multiplication problem, he remains standing. If he cannot give the correct answer, he is out of the "bee."
(3) The team which has the last person standing wins the game.

Note: The game can also be used to teach basic addition, subtraction, and division facts.

56. MULTIPLICATION CONCENTRATION

Objective: Learn basic multiplication facts.

Materials: 24 cards (2" by 2")

Directions:

(1) On the faces of 12 cards write the problems of one table. On the faces of the other 12, write the products of that table.
(2) Divide the playing surface into 2 parts. Problem cards should be face down on one area. Product cards should be face down on the other area.
(3) Two students take turns at up turning a problem card from one side and a product card from the other.
(4) If the 2 turned cards match, the player removes the pair from the game and holds them until all matches have been made. Each pair counts one point for the final score.
(5) If the upturned cards do not match, both are turned face down to be considered again.
(6) The student with the most matched pairs wins the game.

57. LATTICE MULTIPLICATION

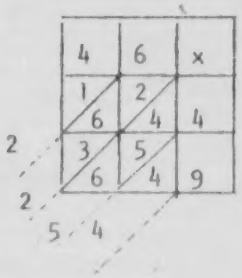
Objective: Understand multiplication of 2 digit numbers.

Materials: None

Directions:

(1) Provide multiplication problems in a diagram as shown below. Copy the blocks and proceed. The first one is done for you.
(2) Have students copy the diagram on their own paper. By using the Lattice method they can arrive at the answers to the multiplication problems.
(3) The problem 46 x 49 is shown according to the Lattice method.

x	46	18	25	31	17
49	2254				
52					
55					
61					
68					

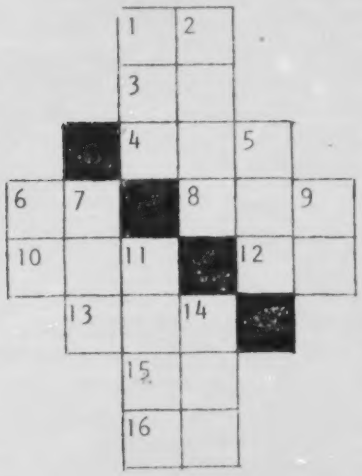


58. MIXED PRACTICE CROSSNUMBER PUZZLE

Objective: Understand addition, subtraction and multiplication of whole numbers.

Materials: Puzzle (below)

Directions:
(1) Provide a puzzle for each student.
(2) Instruct students to fill in the cross number puzzle by working the problems in the "across" and "down" columns.



Across

1. 32 + 52
3. 17 + 34
4. 500 - 253
6. 100 - 24
8. 1000 - 64
10. 810 + 62
12. 6 x 9
13. 18 x 3
15. 100 - 15
16. 100 - 28

Down

1. 825 + 27
2. 399 +15
5. 900 - 165
6. (9 x 8) + 2 + 4
7. 600 + 70 + 5
9. 8 x 8
11. 2400 + 50 + 37
14. 500 - 48

59. EGG CARTON MULTIPLICATION

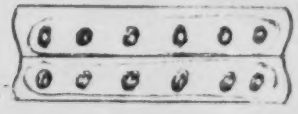
Objective: Learn basic multiplication facts.

Materials: Egg carton, paper, 3" x 5" cards, pencils, beads or small objects

Directions:
(1) Assign each student a multiplication problem.
(2) Demonstrate how an egg carton might be used to solve the problem. See examples below:
(3) Place several egg cartons on a table which illustrate multiplication problems.
(4) Write on multiplication problems on 3" x 5" cards.
(5) Let students match the written problem with its "egg carton answer."
(6) The student who makes the most matches wins.

Example 1.

2 x 6 = ____

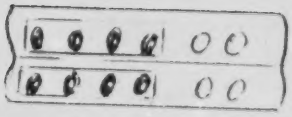


Example 2.

3 x 4 = ____

Example 3.

2 x 4 = ____



60. "COOTIE"

Objective: Learn basic addition and multiplication facts.

Materials: Paper, pencil, one die

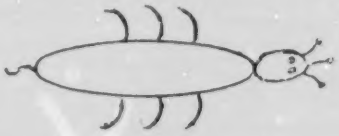
Directions:

(1) Students roll the die trying to get the number they need to "draw" their "Cootie". The first number they must roll is a 1 for the body. Students must roll the following numbers in sequence to complete their drawing

2 = head
3 = tail
4 = one eye (need 2 of these)
5 = feeler (need 3 of these)
6 = leg (need 6 of these)

(As a number is rolled by a student, he must draw the corresponding body part.)

(2) The first person to complete a bug yells "Cootie"! The other players must calculate the number of points of their missing parts, add these up and give them to the winner to add to his score of 65. (This is the total of all the body parts.) The first person reaching 300 points is the grand winner.



61. BUZZ

Objective: Learn basic multiplication facts.

Materials: None

Directions:

(1) Have students stand at their desks.

(2) Let one student choose a number between 2 and 9. If the chosen number is 3, then every time a player comes to the number "3", a number that has "3" in it, or a multiple of "3", he should say "BUZZ". If he does not, he is out and must sit down. For example:

The first player says "one",
The second player says "two",
The third player says "Buzz" (not 3 or you are out),
The fourth player says "four",
The fifth player says "five",
The sixth player says "Buzz", (remember 3 x 2 = 6),
The seventh player says "seven",
The eighth player says "eight",
The ninth player says "Buzz", (remember 3 x 3 = 9),
The tenth player says "ten",
The eleventh player says "eleven",
The twelfth player says "Buzz" (remember 3 x 4 = 12),
The thirteenth player says "Buzz" (remember 13 has a 3 in it),
etc, etc.

(3) The last player standing is the winner of "Buzz".

62. DEALER UP

Objective: Learn basic multiplication skills.

Materials: Two sets of tagboard cards, 20 cards to a set, flash cards with multiplication problems with answers between 1 and 20.

Directions:
(1) Cut 2 sets of tagboard cards, 20 cards to a set.
(2) Number each set from 1 to 20.
(3) Three students are needed to play this game. One student is the dealer. The dealer sits at the head of the table and holds the flash cards. The other 2 players sit on the left and right hand of the dealer facing each other. These 2 students should spread out their set of answer cards in order to easily find any needed number.
(4) The dealer shows one flash card. The first player to find the correct answer card and place it under the flash card problem, wins the flash card.
(5) After all flash cards have been shown, the player with the most cards becomes the next dealer.

63. SPILL THE BUTTONS

Objective: Learn basic multiplication facts.

Materials: Two buttons, tin can, cardboard square divided into 9 smaller squares with a number between 1 and 9 in each square (in no special order).

Directions:
(1) Two players are needed for this game.
(2) Each player takes turns spilling the buttons out of the can onto the board.
(3) To get a point the player must multiply correctly the two numbers on which the buttons landed.
(4) At the end of the play period, the student who has scored the most points is the winner.

64. FLASH CARD DAY

Objective: Learn basic multiplication facts.

Materials: A set of flash cards for each student.

Directions:
(1) Instruct each student how to make a set of multiplication cards.
(2) Be sure that each card has the correct answer on the back.
(3) Let each student make a chart on a 3" x 5" index card on which he may record a series of dates and scores.
(4) Pair students. One student will hold up the flash cards while the other answers the problem as quickly as he can.
(5) Instruct students not to start until they hear the word "Go." When they hear the word "Stop," they must stop the game.
(6) The student holding the cards must show the problems to his partner. The correctly answered problems should be placed in one stack and the wrongly answered problems should be placed in another.
(7) When the time has come to stop the game, each student should record the date and number of cards correctly answered.
(8) Partners exchange places in order to give both students a chance to practice the multiplication facts.
(9) Cards should be placed aside in a safe place for another day.

65. X - O MATCH

Objective: Learn basic multiplication facts.

Materials: Multiplication "bingo" cards, multiplication flash cards, small chips

Directions:
(1) Provide a multiplication "bingo" card for each student such as the following:

18	54	72	6	11
10	36	27	50	45
33	44	Free	73	81
15	28	100	99	64
121	25	144	49	0

(2) The leader of the game shows a multiplication flash card to the players. If a student has the answer to the problem on his card, he can cover it with a chip.
(3) The first student to correctly cover a line, either vertically, horizontally, or diagonally wins the game and becomes the caller for the next game.

66. CAR BUYING

Objective: Find averages of whole numbers.

Materials: Newspapers, scissors, tape or glue

Directions:

(1) Present the following problem to students:

Mr. Smith wants to buy a used car. Use the classified section of the newspaper to help him find the best deal. Look at ads for cars which are 1 year old, 2 years old, etc.

(2) As students find ads for cars, they should complete Section A of their worksheet.

(3) Instruct students to add the prices in each column. They should write the totals in Section B of the worksheet.

(4) Show students how to find the average price of each year's cars by dividing the total prices for a certain year by 10.

(5) The average cost for each year's cars should be recorded in Section C.

(6) Let students discuss what model car Mr. Smith should buy, which model would cost least, cost most, etc.

Worksheet

Section A (Individual costs)	1977	1976	1975	1974	1973	1972
1.	____	____	____	____	____	____
2.	____	____	____	____	____	____
3.	____	____	____	____	____	____
4.	____	____	____	____	____	____
5.	____	____	____	____	____	____
6.	____	____	____	____	____	____
7.	____	____	____	____	____	____
8.	____	____	____	____	____	____
9.	____	____	____	____	____	____
10.	____	____	____	____	____	____
Section B (Totals)	____	____	____	____	____	____
Section C (Averages)	____	____	____	____	____	____

67. FACTOR-MULTIPLE GAME

Objective: Understand the meaning of multiples and factors.

Materials: 36 cards (3" x 4"), small cube

Directions:
(1) On the 36 cards, print the numbers below twice on each card according to following examples:

(2) On the small cube print a number on each face. Use 2, 3, 4, 5, 6, 7.
(3) A student should shuffle the cards and deal them to the other players.
(4) Another student should roll the cube. The player with a number that is a multiple of the number on the top of the cube should place that card in the middle of the table.
(5) The cube is rolled again by another student. The player who gets rid of all cards first is the winner.

68. BASEBALL BATTING AVERAGES

Objective: Understand averages.

Materials: Ball and Bat

Directions: Divide the group up into two teams and enjoy the baseball game. The next day in class or at the end of that class period the following topics should be discussed: Area of baseball diamond; multiplication by 0; (a player is at bat 3 times and never gets a run, therefore, 3 x 0 = 0); figure out batting averages of each student.

The teacher should keep a tally of each child's batting activities.

(1) During baseball season let the baseball players in class keep a record of their batting ability. They should keep a score card such as the following:

Baseball Game Scoreboard

Player	Date	Times at bat	Hits	Outs	Walks	Average

(2) Help students to understand how to find their batting average.

69. NUMBERLESS DIVISION

Objective: Understand division of whole numbers.

Materials: None

Directions:
(1) Present the problem below to students.
(2) Explain that each letter stands for a particular number and that a letter always represents the same number.
(3) The student who is able to work the problem by correctly substituting numbers first is the winner.

```
      FDZ
AX) GHZX
     AX
     FFZ
     FEE
      FZX
      FZX
```

70. CONSTRUCTION PAPER FRACTIONS

Objective: Understand addition of fractions.

Materials: Construction paper, scissors, mimeographed circle for each student.

Directions:
(1) Prepare "fractional pies" for students.
(2) Distribute "pies", scissors, and construction paper to students.
(3) Instruct students to follow the directions listed below to complete their work.
   a. Cut a circle from construction paper the same size as the one given to you.
   b. Cut your circle in two even pieces. Cover the whole circle with one of your pieces. How much is covered?_____ Does 1/2 + 1/2 = 1 whole?___
   c. Cut each of your halves into two pieces. You should have 4 equal parts now.
   d. Cover the whole circle with all 4 pieces. Can we say that 1/4 + 1/4 + 1/4 + 1/4 = 1 whole?___
   e. Cover half of the whole circle with fourths. Make an equation to show this. ____ + ____ = ____
   f. Cut one fourth into two equal pieces. This gives you two eighths. Can we say that 2/8 = 1/4?___
   g. How many eighths would it take to cover 1/2 of the whole circle?___ Complete the following equation: __/8 = 1/2.
   h. Are the following equations true?
      4/8 = 1/2 2/4 = 1/2 4/8 = 2/4
   i. How many eighths are needed to cover 3/4 of the whole circle?___ Does 6/8 = 3/4?___

71. YARDSTICK GAME

Objective: Understand addition and subtraction of fractions.

Materials: Yardstick, colored markers, 36 direction cards with instructions such as "Move forward 1/2 foot" and "Move back 1/3 yard", "move forward one foot," etc.

Directions:
(1) A student should shuffle the 36 direction cards and place them face down.
(2) Players take turns choosing a direction card.
(3) Students must use the colored markers to follow the instructions on the card.
(4) Players can not move backward beyond the one inch mark.
(5) If a player is on the 35 inch line, he must draw the "move forward one inch" or "move forward 1/12 foot" or "move forward 1/36 yard" to win the game.
(6) If cards run out before a student wins, the cards must be reshuffled to continue the game.

72. FRACTION SUBTRACTION

Objective: Understand subtraction of fractions.

Materials: Cuisenaire rods

Directions:
(1) Provide the following instructions for students:
  (a) Find a blue rod and a light green one. Place them side by side.
  (b) Make a "train" of light green rods to equal to a blue rod. How many light green rods are needed?____
  (c) Take one light green rod away. How many are left?___ Does 2/3 + ____ = 3/3?
  (d) Take two light green rods away. How many are left?___ Does 3/3 - 2/3 = 1/3?____
  (e) How many white rods are equal the blue rod?___
  (f) Take 5 white rods away. What part is left?___
  (g) Finish the following equations: 9/9 - 5/9 = ____; 5/9 + ____ = 9/9.
  (h) How many white blocks are equal to one light green block?___
  (i) Does 2/3 + 1/3 = 1?___
  (j) Does 3/3 - 1/3 = 2/3?___
  (k) 3/3 - ___ = 1/3

73. ADDITION OF FRACTIONS USING CUISENAIRE RODS

Objective: Understand addition of fractions.

Materials: Cuisenaire rods, paper, pencils, worksheet (see below)

Directions:

(1) Prepare worksheets as shown below for each student. Notice that it is divided into six columns. The first 2 columns are used by students to write the first fraction identified through use of the cuisenaire rods. The third and fourth columns are used by students to write the second fraction. In between these columns is found a "+" sign which means that the students are to add the two fractions. Following the fourth column is an "=" sign. Students should use Columns 5 and 6 to write the answer to their addition problem. In other words:

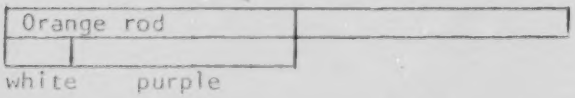
Column 1/Column 2 + Column 3/Column 4 = Column 5/Column 6

	Column 1 / Column 2	+	Column 3 / Column 4	=	Column 5 / Column 6
EXAMPLE	1 / 3	+	1 / 3	=	2 / 3
	__ / __	+	__ / __	=	__ / __
	__ / __	+	__ / __	=	__ / __
	__ / __	+	__ / __	=	__ / __

(2) Distribute worksheets and cuisenaire rods to each group of students. The longest cuisenaire rod should represent the whole number 1. All of the smaller rods can be thought of as fractional parts of the largest rod.

For example: orange = 1
white = 1/10 (because 10 white rods are equal to 1 orange rod)
purple = 2/5 or 4/10 (because 4 white rods are equal to 1 purple rod)

(3) Students can add 2/5 + 1/10 by placing the white rod and the purple rod end to end. They can then place the orange rod directly above these two to see what the answer to the problem is.



If students still cannot figure out the answer they can compare the lengths of the white and purple rods to the other rods which have already been identified. Doing this they will find that white + purple = yellow (which represents 1/2. The answer to the problem then is 1/2 (2/5 + 1/10 = 1/2).

74. FRACTION REVIEW

Objective: Understand multiplication of fractions.

Materials: Paper, pencils

Directions:

(1) Give the following instructions to students:

In order to do this activity you must understand how to multiply fractions. In multiplying two fractions, remember to multiply the two numerators together, then multiply the two denominators together.

1/2 x 1/2 = 1/4

3/5 x 4/7 = 12/35

In multiplying two fractions which are whole numbers and fractions, change the whole number to a fraction and add it to the fractional part.

1 1/2 x 1 1/4 = _____

6/2 x 5/4 = 30/8 = 3 6/8 or 3 2/3

Match the following multiplication problems to their correct answers by drawing a line to join the correct parts.

1/2 x 1/2	2/6 or 1/3
2/3 x 1/2	27/8 or 3 3/8
4/5 x 3/7	12/35
1 2/3 x 3/4	1/4
2 1/4 x 1 1/2	15/30 or 1/2
3/5 x 5/6	15/12 or 5/4 or 1 1/4

75. FRACTION ACTION

Objective: Understand the differences in sizes of fractions.

Materials: Cuisenaire rods, paper, pencils.

Directions:

(1) Students should line up one rod of each color from smallest to largest in size.

(2) Let each color represent a number. Since white is smallest, assign it the number one. Prepare a chart as follows and complete it for the other numbers.

		red	Fraction	lt.green	Fraction
white	1	2	1/2	3	1/3
red	2	2	2/2 = 1	3	2/3
light green	3	2	3/2	3	3/3 = 1
maroon	4	2	4/2 = 2	3	4/3
yellow	5	2	5/2	3	5/3
dark green	6	2	6/2 = 3	3	6/3 = 2
black	7	2	7/2	3	7/3
brown	8	2	8/2 = 4	3	8/3
blue	9	2	9/2	3	9/3 = 3
orange	10	2	10/2 = 5	3	10/3

76. SANDWICH FRACTIONS

Objective: Understand how to write fractions with greater denominators and numerators.

Materials: 3" x 3" construction paper squares, worksheet, dinner knife and bread (optional)

Directions:
(1) Prepare worksheets for students (see below).
(2) Distribute worksheets to students as individual or small group work. If bread is used, distribute 5 slices per group and a dinner knife so that students can cut bread according to directions on worksheet.

SANDWICH FRACTIONS

Equal fractions can be shown by sandwiches (either real or of paper). Think of each square below as a piece of bread.

1.
   a. Cut one piece of "bread" into two equal parts.
   b. Each part is ___ of the whole piece.
   c. How many halves are there in one whole piece?___

2.
   a. Cut one piece of "bread" into 4 equal parts.
   b. Each part is ___ of the whole piece.
   c. It takes ___ of these parts to make 1/2 of one piece of bread?
   d. ___/4 = 1/2.

3. Shade 1/2 of each "sandwich" below. (Cut your "bread" according to the pictures to help find the answers below.)

4. Complete the following equations:

   1/2 = ___/6 1/2 = ___/10 1/2 = ___/16

5. Change the fractions below to another form by multiplying both the denominator and numerator by the same number:

   Example: $1/2 = 3/6 \quad \frac{(1 \times 3 = 3)}{2 \times 3 \quad 6}$

   (2) 2/3 = _____ (b) 3/5 = _____ (c) 1/4 = _____

6. Decide if the following are true or false.
   ____ (a) 1/2 = 2/4 ____(c) 2/5 = 6/10
   ____ (b) 2/4 = 12/16 ____(d) 1/6 = 2/16

77. FRACTIONS WITH CUISENAIRE RODS

Objective: Understand the meaning, relation, and formation of fractions.

Materials: Cuisenaire rods, worksheet, paper, and pencil

Directions:
(1) Prepare a worksheet such as the one below.
(2) Distribute worksheets and cuisenaire rods. Students may work individually, in pairs, or in small groups.

WORKSHEET

1. In this activity cuisenaire rods have been assigned a number according to their size as follows:

white = 1	dark green = 6
red = 2	black = 7
green = 3	brown = 8
maroon = 4	blue = 9
gold = 5	orange = 10

2. Form two horizontal columns on a piece of paper. In Column One place a white rod. In Column Two place a red rod. Write the numbers in the columns which are assigned to these colors. Another way to look at this is:

$$\frac{\text{Column One}}{\text{Column Two}} \quad \text{or} \quad \frac{\text{white}}{\text{red}} \quad \text{or} \quad \frac{1}{2}$$

Is the white rod really 1/2 of the red rod?____
How many white rods are equal to one red rod?____

3. Change the red rod for a green rod. What fraction is formed now?____

$$\frac{\text{white}}{\text{green}} = \frac{1}{3}$$

4. Use different color rods in both columns to form at least 10 other fractions.

Example: Column One / Column Two $\frac{\boxed{\text{Gold}}}{\boxed{\text{Orange}}} = \frac{5}{10} = \frac{1}{2}$

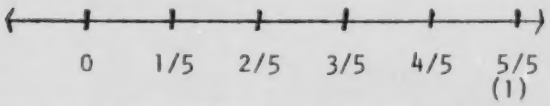
78. FRACTION NUMBER LINE ADDITION

Objective: Understand addition of fractions.

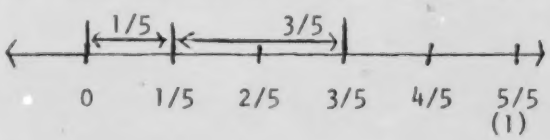
Materials: Number line for each student

Directions:

(1) Teach students how to construct a number line using fractions. Let each student construct a number line as follows:

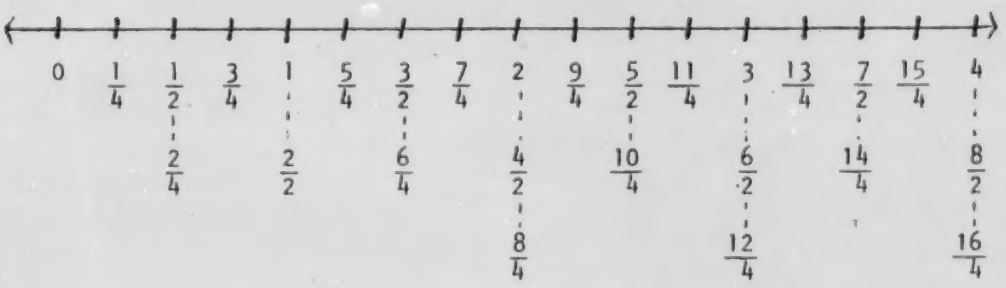


(2) Let students add 1/5 + 3/5 using their number lines.



1/5 + 3/5 = 4/5

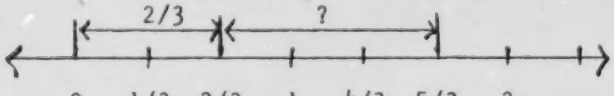
(3) Let students construct a number line as follows:



(4) Using the number line students should be able to add these fractions.

(a) 1/2 x 3/2 = ___
(b) 0 + 1/2 = ___
(c) 1/2 5/4 = ___
(d) 1/4 + 5/4 = ___
(e) 6/4 + 8/4 = ___
(f) 1/2 + 2/4 + 5/4 =

(5) Present the following to students:



2/3 + _____ = 5/3

79. EXPLORING FRACTIONAL PARTS

Objective: Understand the meaning of fractions.

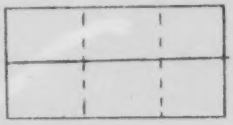
Materials: Worksheet (see below), crayon

Directions:
(1) Distribute a copy of the worksheet below to each student.
(2) Instruct students to shade the correct portion of the three figures with any color.
(3) In the second part of the worksheet students must identify fractions on a number. Instruct them to circle the correct dot for each given fraction.

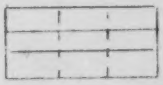
WORKSHEET

Fraction Exploration

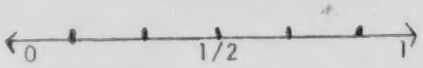
1. Shade the correct portions:

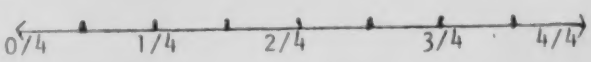
a. 1/6 

b. 3/8

c. 2/9 

2. Find the given fraction on the number lines.

a. Find 5/6. 

b. Find 6/8. 

80. WORKING WITH THE BALANCE SCALE

Objective: Understand addition and subtraction of fractions.

Materials: Balance beam, weights

Directions:
(1) Instruct students to solve the problems below:

1/10 + 1/10 =
1/10 + 1/5 =
1/2 + 1/5 =
1/10 + 1/5 + 3/10 =
2/10 =
4/5 = ___/10
10/10 =
1/2 + 2/5 + 1/10 =
1/5 + 3/5 =
3/5 + 2/5 + 1/5 =
10/10 + 1 =
1/5 + 3/10 + 2/5 =
1/2 + 1/2 + 1/10 + 2/10 =
1/2 = ____/10
1/5 = ____/10
8/10 + 9/10 =
3/4 + 1/2 =
7/8 + 1/2 =
4/8 =
1/8 + 1/2 =
1/4 + 1/4 =
3/4 + 1/4 =

4/5 - 3/5 =
7/8 - 3/8 =
1/2 - 3/8 =
2/6 - 1/3 =
2/3 - 1/4 =
6/10 - 1/10 =
6/8 =
2/4 =
12/16 =
1/2 - 3/10 =
3/4 - 1/6 =
6/10 - 1/5 =
2/3 - 1/3 =
6/8 - 1/2 =
4/9 - 1/3 =
5/10 - 1/5 =
8/14 - 1/7 =
3/6 - 1/3 =
3/12 =
3/10 + 4/10 + 2/10 =
5/12 + 1/12 =
7/6 - 1/6 =

(2) Encourage students to use the mathematical balance beam to check their answers.
(3) Other problems may be written to change the assignment.

81. DOZENTHS

Objective: Understand addition, subtraction, multiplication and division of fractions.

Materials: Red and yellow construction paper

Directions:

(1) Prepare 6 each of the following squares using red construction paper:

1/12	5/12	7/12	11/12

(2) On a yellow piece of construction draw the following game board.

□ - □ = 1/2	□ + □ = 1 1/2
□ + □ = 2/3	□ - □ = 1/6
□ - □ = 1/3	□ + □ = 1/2
□ + □ = 1 1/3	□ + □ = 1

(3) Students place the red squares face down on the table in one pile.
(4) Players take turns drawing from the pile of red squares until all are drawn.
(5) Each player, in turn, places one square on the game board. If a player is wrong and is challenged, he must take his square back. The challenger, if correct, gets an extra turn. If the challenger is wrong, the player who made the challenged move gives one of his squares to the challenger.
(6) The first player to use all cards is the winner.

82. MARBLE CUP MATHEMATICS

Objective: Estimate volume

Materials: Measuring cup, marbles, water

Directions:
(1) Fill the cup with marbles.
(2) Pour water into the cup to measure one cup.
(3) Remove the marbles without taking any water out of the cup.
(4) Measure the amount of water in the cup without the marbles.
(5) Help students to realize that the water filled the air spaces left in the cup while the marbles were in the cup. (If 1/4 cup of water is left in the cup after removing the marbles, then there was 1/4 cup of air in the cup before the water was added.)

83. TAKE THREE CARDS

Objective: Understand unlike fractions.

Materials: 60 two-inch paper squares, small box

Directions:
(1) Cut sixty 2" squares of paper.
(2) On each square write a number from 1 to 20. Make 3 duplicates of each number.
(3) Place all squares in a box.
(4) Each player takes 3 cards from the box. Students should imagine that the numbers are denominators in a fraction problem.
(5) As players draw 3 cards, they must be able to tell what the common denominator would be. If the student gives the correct denominator he scores 3 points.
(6) The cards are replaced after each student's turn.
(7) At the end of 10 rounds, the student with the highest score is the winner.
(8) Variation: Have students to write down the 3 numbers drawn and then the common denominator.
For example: 3 - 6 - 18 LCD = 18

8 - 5 - 4 LCD = 40

Students can turn in their score cards to be checked.

84. FRACTION DICE

Objective: Multiply and add fractions.

Materials: A set of dice

Directions:
(1) Each player rolls the dice twice. The two numbers rolled with each throw of the dice must be changed into the largest possible fraction. Example: If the student rolls a 6 and 2, it becomes 6/2. Do the same for the second throw. Example: If the student rolls a 5 and a 2, it is 5/2.
(2) The students must multiply the two "fractions" thrown to get a score for that turn. Example: $6/2 \times 5/2 = 30/4$.
(3) After each player has had 5 turns, the scores must be added. The player with the highest score wins.

85. DIVIDING UP YOUR DAY

Objective: Add fractions.

Materials: None.

Directions:
(1) Let students make a chart of their daily activities. Each activity should be timed and a record kept.
(2) Help students to turn the timing for an activity into a fraction. For instance, if a particular activity lasted 40 minutes, the fraction would be 40/60 or 2/3.
(3) When all timings have been translated into fractions, add all fractions for a grand total. (Hopefully, it should add up to 24 hours.)

86. SCULPTURED FLOWERS

Objective: Understand the concept of fractions.

Materials: Wall paper and textured paper scraps, scissors, ruler, green paper, glue

Directions:
(1) Instruct the student to fold the piece of wall paper into 16 equal sections. Using a ruler may make this easier.
(2) The student should cut along the fold lines. He should realize that the 16 pieces make one whole and that 1 piece is really 1/16 of the whole.
(3) The object of this activity is to use the 16 pieces to make a flower. The student can use all or any portion of his 16 pieces to make a flower. He should cut them into any design he wishes.
(4) To fill in the center, small particles of wall paper or crushed tissue paper can be glued in place. Lastly, a stem and several leaves can be cut from green paper and glued in place.

87. FRACTION MAGIC SQUARES

Objective: Addition of fractions.

Materials: One 11" x 11" master square, nine 3" x 3" squares

Directions:

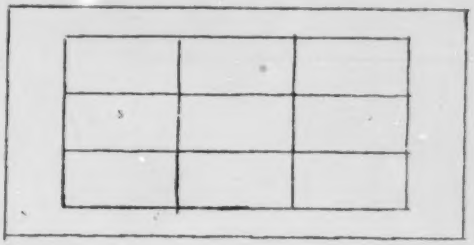
(1) Prepare one master square and nine numbered squares for each pair of students who will be playing the game. (The squares should be numbered as follows: 1/4, 1/16, 3/8, 9/16, 7/16, 5/16, 1/2, 3/16, 5/8.)

(2) Give a master square and the nine numbered squares to a pair of students or to a student who is working alone.

(3) Direct students to arrange the nine small squares in such a way that the sum of each diagonal, horizontal, and vertical column is equal to 21/16 or 5/16.

1/4	11/16	3/8
9/16	7/16	5/16
1/2	3/16	5/8

3" x 3" unit squares



11" x 11" master square
(Cut along outer border only)

88. FRACTION CROSSNUMBER PUZZLE

Objective: Addition, subtraction, and division of fractions.

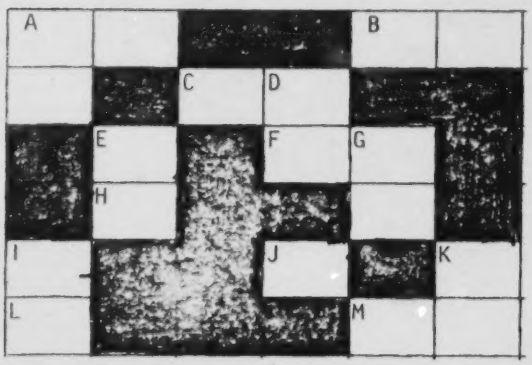
Materials: Crossnumber puzzle

Directions:

(1) Give each student a crossnumber puzzle and the problems for across and down.

(2) Allow 5 minutes for students to work the problems and fill in the puzzle. Keep a record of how many can work the problems within 5 minutes and those who take longer.

(3) After further instruction in addition, subtraction, and division of fractions, give the crossnumber puzzle to the students who took longer than 5 minutes on the first try. If they can complete the puzzle accurately in less time than before, you have done a good job!



Across:

A. 14 1/2 + 3 1/2
B. 12 2/3 + 1 1/3
C. 2 1/6 + 3 5/6 + 7
E. 2/4 + 2/4
F. 1/2 of 84
H. 4 3/8 - 3 3/8
I. 3/9 = 1/
J. 1-3/4 = 1/____
K. 10/10 =
L. 16/32 is the same as 1/__
M. 1/4 of 16 added to 3/4 of 16

Down:

A. 20 1/3 - 7 1/3
D. 1/4 of 136
E. 5 1/2 + 5 1/2
G. 4/5 of 25
I. 64 1/2 - 32 1/2
K. 1/2 of 16 added to 1/4 of 32

89. FRACTION DOMINOES

Objective: Add fractions.

Materials: 26 2" x 4" paper rectangles

Directions:
(1) Mark each rectangle to resemble dominoes. Each half of the "domino" should have a problem on it which has the same answer as the problem on the other half. (For example: 1/2 + 1/2, 3/4 + 1/4, 2/3 + 1/3, 1/5 + 4/5).
(2) Mark two wild cards.
(3) Each player draws 4 dominoes to begin the game. The remaining dominoes are placed face down on the table.
(4) The first player must lay one domino in the center of the table.
(5) The second player must match the end of the domino with those cards in his hand. If he has no matching card in his hand, he must draw from the deck until he finds a card to match the one on the table.
(6) The first player to use all cards is the winner.

90. CONCENTRATION

Objective: Rename fractions as equivalent fractions.

Materials: One sheet of large poster paper with 26 numbered pockets; 26 cards which will fit into the pockets.

Directions:
(1) Prepare the 26 cards by writing a fraction on one card which has an equivalent fraction on another card. (Example: 1/2 and 3/6 on 2 cards; 1/5 and 3/15 on 2 cards.)
(2) Each player chooses 2 cards from the shuffled cards. If the two cards are equivalent the player can keep them. If they are not he must put them in pockets on the poster.
(3) As other students take their turn and do not draw a match they can try to match their cards with those on the poster.
(4) Each student keeps the card that he is able to match. At the end of the game, the player with the most matches wins.

91. HOW DOES A PENDULUM WORK?

Objective: Read and draw graphs

Materials: Thread, ruler, weights, watch with sweep second hand, worksheet (see below)

Directions:
(1) Prepare worksheet for each student.

HOW DOES A PENDULUM WORK

1. Complete the table below by making pendula with strings of the noted length and by using two different weights:

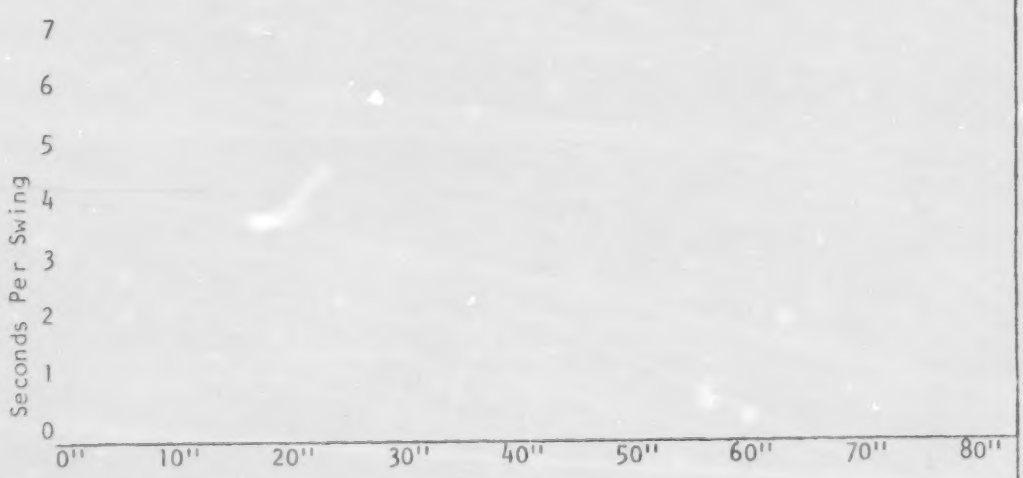
String Length	10"	20"	30"	40"	50"	60"	70"	80"
Swings per minute #1								
Swings per minute #2								

What seems to be the effect of varying the weight?_____
What seems to be the effect of varying the length of the pendulum?_____

2. Using the numbers above, compute the number of seconds per swing for each length pendulum:

String Length	10"	20"	30"	40"	50"	60"	70"	80"
Seconds per swing #1	___	___	___	___	___	___	___	___
Seconds per swing #2	___	___	___	___	___	___	___	___

3. Locate points on the graph below showing the points from the table in 2 above:



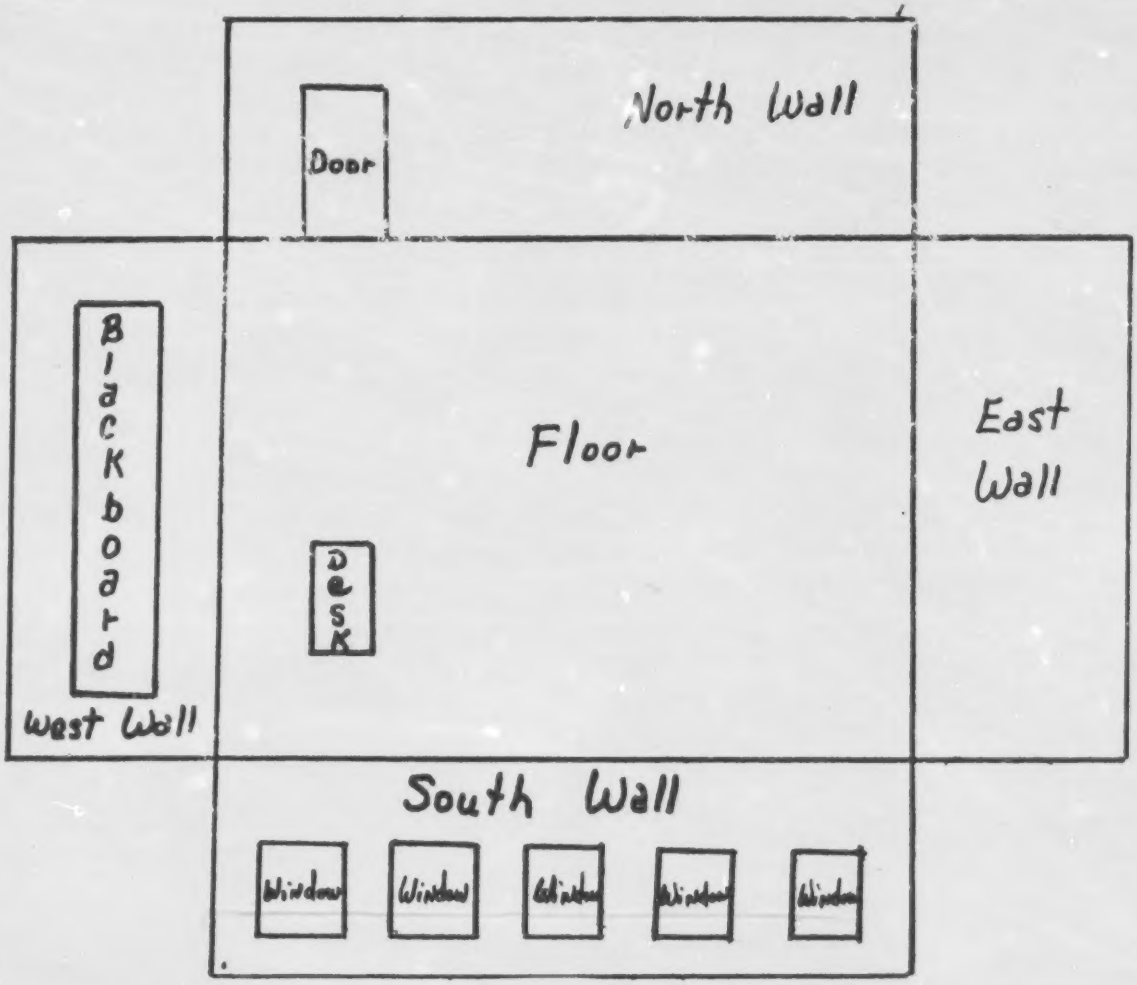
4. Sketch the smooth curve through the points.

92. SCALED DOWN TO SIZE

Objective: Understand and use scale drawings.

Materials: Protractor, ruler, scale drawing of classroom

Directions:
(1) Give each student a copy of the scaled drawing of a classroom such as the one below.
(2) Students use the drawing and a ruler to answer questions about the drawing and the real classroom from which the drawing was made.



1" = 8 feet

92. SCALED DOWN TO SIZE (Continued)

	Drawing	Real Classroom
1. What is the length of the room?	_____	_____
2. What is the width of the room?	_____	_____
3. What is the height of each wall?	_____	_____
4. How high is the door?	_____	_____
5. How side is the door?	_____	_____
6. How far is the door from the corner of the west wall?	_____	_____
7. How wide is each window?	_____	_____
8. How tall is each window?	_____	_____
9. How far apart is each window?	_____	_____
10. How high are the windows off the floor?	_____	_____
11. How long is the blackboard?	_____	_____
12. How tall is the blackboard?	_____	_____
13. How high is the blackboard off the floor?	_____	_____
14. How long is the desk?	_____	_____
15. How wide is the desk?	_____	_____
16. How far is the desk from the south wall?	_____	_____
17. How far is the desk from the west wall?	_____	_____

(3) Let students measure their own classroom and make a scaled drawing of it.

93. WAIST SIZE-24 INCHES OR 61 CENTIMETERS?

Objective: Compare centimeters and inches.

Materials: Centimeter tape measure, inch tape measure, plain white paper, tape, books (various sizes), 5 index cards.

Directions:
(1) Prepare the following activities on 5 different index cards.

Card 1
a. Measure your waist with the tape marked in inches. Write the number of inches on the record sheet.
b. Measure your waist with the tape marked in centimeters. Write the number of centimeters on the record sheet.
c. Divide the centimeters by the inches.

Card 2
a. Tape a piece of plain white paper on the wall about your height. Have a friend mark your height on the paper.
b. Measure from the floor to the mark on the paper with the tape marked in inches. Record the number.
c. Measure from the floor to the mark on the paper with the tape marked in centimeters. Record the number.
d. Divide the centimeters by the inches.

Card 3
a. John wants to buy a hat. He needs to know how big his head is in order to know what size to buy. The store manager has a tape marked in inches, but the size on the hat is in centimeters. After you finish this exercise, see if you can tell how John can figure what size to buy.
b. Measure around your head with the tape marked in inches. Record the number.
c. Measure around your head with the tape marked in centimeters. Record the number.
d. Divide the centimeters by the inches.
e. What number must John multiply times the inches to give him the number of centimeters around his head?

Card 4
a. Measure your hips with a tape marked in inches. Record.
b. Measure your hips with a tape marked in centimeters. Record.
c. Divide the centimeters by the inches.

94. CONVERSIONS

Objective: Understand relationship between various measurements.

Materials: Dry measuring set, calendar or clocks, ruler and yardstick.

Directions:
(1) Provide the following problems for students.
(2) Acquaint students with the various measurement equipment.

A. Use dry measure set to find:

1 peck	=	____quarts	1 quart	=	____bushel
1 bushel	=	____pecks	8 quarts	=	____pint
1 peck	=	____pints	2 bushels	=	____pecks
1 bushel	=	____pints	5 quarts	=	____pints

B. Use calendar or clock to find:

1 year	=	____months	24 months	=	____years
1 day	=	____hours	1095 days	=	____years
4 weeks	=	____month	120 seconds	=	____minutes
96 hours	=	____days	15 minutes	=	____hours

C. Use yardstick and ruler to find:

1 foot	=	____inches	1 ft.,12 in.	=	____feet
9 feet	=	____inches	24 inches	=	____yard
1/3 yard	=	____feet	2 yards	=	____inches
6 feet	=	____yard	2/3 yard	=	____feet

D. Add and simplify the following:

2 ft. 4 in.	5 ft. 8 in.	4 bushels 1 peck	6 days 23 hours
1 ft. 2 in.	3 ft. 7 in.	1 bushel 2 pecks	3 days 6 hours
5 ft. 3 in.			

21 hours 4 minutes 35 seconds	2 quarts 5 pints
15 hours 32 minutes 50 seconds	1 quart 2 pints
	3 quarts 1 pint

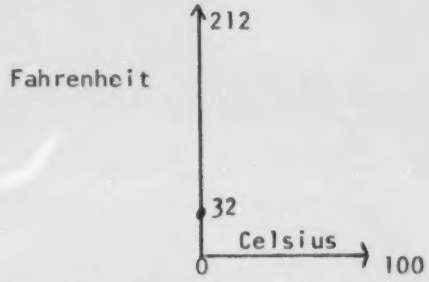
95. WHAT'S THE TEMPERATURE?

Objective: Describe graphically the relationship between Fahrenheit and Celsius scales.

Materials: Fahrenheit and Celsius thermometers

Directions:

(1) Prepare a graph with coordinates naming the Celsius and the Fahrenheit measures.



(2) Plot the freezing and boiling temperature on the coordinates.

(3) Since both scales increase uniformly, the graph is a straight line. Draw a line through the boiling points on each axis.

(4) Use the graph to determine what the Fahrenheit temperature is when the Celsius temperature is 50?
(Note that 50 is halfway between 0 and 100. Ask students if this has anything to do with their answer.)

(5) Let students use their graphs to fill in the table below:

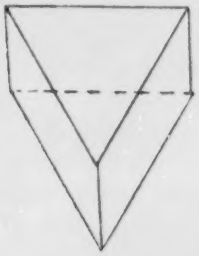
Celsius	0	10	20	30	40	50	60	70	80	90	100
Fahrenheit	32	___	___	___	___	___	___	___	___	___	212

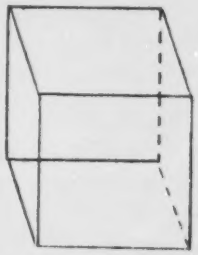
96. EXPERIMENTING WITH PRISMS

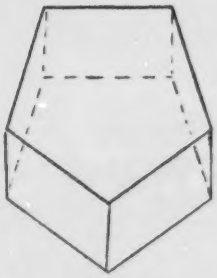
Objective: Find volume of a prism.

Materials: One box of square cubes

Directions:
(1) Define prism for students.
(2) Draw examples on the board.







(3) Instruct students to use the 1" square cubes to make a block 4" x 4" x 1".
(4) Help students find the volume of the block they have made. Is the block a prism?____ Does the block fit the description of a prism? _____ If one corner cube is taken away, is the block still a prism?____
(5) Let students discover that every time a cube is taken away, the base is changed but the height is not. When the height is 1" and the area of the base (4" x 6") is 24 square inches, then the volume is 24 cubic inches.
(6) Students can extend this exercise by making another block 2" high and covering 24 square inches. To find the volume they can count the cubes.
(7) Finally, help students find a formula for finding volume.

97. BICYCLES AND EGG BEATERS-AN ODD COMBINATION!

Objective: Determine ratios

Materials: Egg beater, bicycle

Directions:

(1) Let students observe and turn an egg beater. Encourage discussion about the movement of an egg beater following the observations.

(2) Present the following question to the students. While the handle turns one time, how many times does the beater turn?___

(3) Explain that the turns of a beater can be compared to the turns of the handle with a ratio. If there were two turns of the beater with one turn of the handle the ratio would be 2:1.

(4) Let students find the ratios for
   (a) turning the handle 2 times ____.
   (b) turning the handle 3 times ____.

(5) Another way to help students understand ratios is to use a bicycle

(6) Turn the bicycle upside down, and put the bicycle in high gear. Be sure the valve stem on the back wheel is on the bottom and the foot pedal is up.

(7) Turn the foot pedal one full turn very slowly. Let students count how many times the back wheel goes around by counting how many times the valve stem goes around. This ratio of wheel turns to pedal turns would be ____.

(8) Turn the pedal three times and count the turns of the back wheel. This ratio is __:3__.

(9) Move the bicycle to middle gear and find the ratios as the pedal makes one turn, two turns, and three turns.

(10) Move the bicycle to low gear and find the ratios as the pedal turns once, twice, and three times.

(11) Prepare a chart to record the ratios. Students may want to turn the wheel again to be sure of their answers.

High gear	Middle gear	Low gear
1 turn (:1)	1 turn (:1)	1 turn (:1)
2 turns (:2)	2 turns (:2)	2 turns (:2)
3 turns (:3)	3 turns (:3)	3 turns (:3)

(12) Follow the activity by discussing the following questions:
   (a) How many turns does the wheel make when the pedal is turned one time in high gear?____
   (b) How many turns does the wheel make when the pedal is turned one time in middle gear?____
   (c) How many turns does the wheel make when the pedal is turned in low gear?____
   (d) Which gear will allow the rider to go faster?_____

98. NO BAKE CHOCOLATE COOKIES

Objective: Understand measurements and fractions.

Materials: 2 cups sugar, 1/2 cup milk, 1 stick margarine, 3 tablespoons cocoa, 1 teaspoon salt, 1 teaspoon vanilla, 3 cups raw quick rolled oats, 1/2 cup coconut, large saucepan, hot plate, spoon, waxed paper

Directions:
(1) Get ingredients and equipment together to make cookies.
(2) Let students measure to make sure the exact amount of ingredients are available.
(3) Assign the "cooking" to one group or provide enough ingredients that several groups can make cookies. They should follow the following directions:

Mix sugar, milk, margarine, cocoa and salt in large saucepan and bring to a boil. Remove from heat and stir in the rolled oats, vanilla, nuts, and coconut. Drop from teaspoon onto waxed paper. Makes 48 cookies.

(4) Extend the activity to require that students rewrite the recipe for 96, 144, 192, 240, and 288 cookies.

99. MATH KITCHEN

Objective: Solve word problems involving fractions.

Materials: Recipes

Directions:
(1) Ask students to bring a recipe from home.
(2) Discuss each recipe to point out that fractions are not just in math class.
(3) Make word problems for the students using several of the recipes with questions such as:
(a) For all recipes used, how much baking soda is required?
(b) For all recipes used, how much flour is used?
Students must know all the fractional parts required in each recipe to answer these questions.
(4) The recipes can be collected and copied into booklets for Christmas or Mother's Day gifts.

100. THE HEAVY THUMBTACK

Objective: Estimate weight.

Materials: Scales, thumbtacks

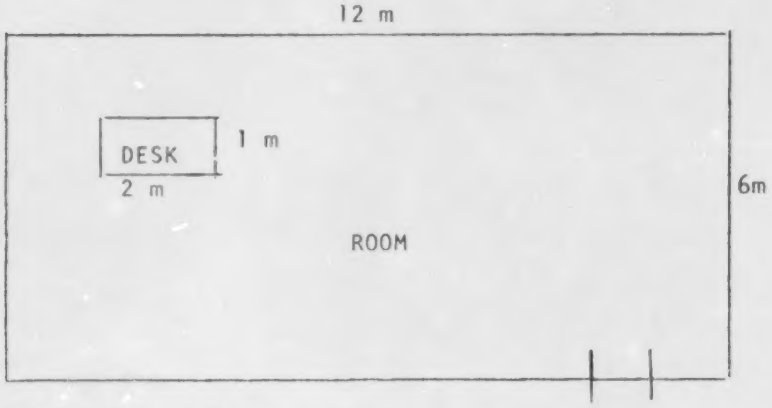
Directions:
(1) Present each group of students with a box of thumb tacks.
(2) Ask the group to discuss the best way to estimate the weight of one thumbtack. (Hint: If they measure the weight of 100 thumbtacks, they can divide this weight by 100 to estimate the weight of one thumbtack.)

101. METRIC MEASURES

Objective: Find perimeters using metric units.

Materials: Metric measuring equipment

Directions:
(1) Students should be assigned various objects in the room which they can measure and find the perimeter (blackboard, desks, doors, etc.)
(2) Let students share their findings. These measurements should be written on the board.
(3) Students can use these measurements to design a scale drawing of the classroom and the objects within it.
(4) Have students label the various objects on their drawing and give the dimensions according to the drawing below.



Room-- 12 m x 6 m
P = 2(12 m) + 2(6 m)
P = 36 m

Desk-- 1 m x 2 m
P = 2(1 m) + 2(2 m)
P = 6 m

102. JUST A DROP IN THE BUCKET

Objective: Estimate liquid measurement.

Materials: Eye dropper, measuring spoons, and measuring cup

Directions:
(1) Using an eyedropper and spoons, let students determine how many drops are needed to fill an 8 ounce cup.
(2) They can then estimate how many drops it would take for a pint, a quart, and a gallon.
(3) Students should make a record of their answers and be able to explain them.

103. A WEIGHTY PROBLEM

Objective: Estimate weights.

Materials: 2 stones which have about the same volume

Directions:
(1) Let the students examine the two stones.
(2) Discuss the weight of each. Are they the same weight?

104. FILL 'ER UP

Objective: Estimate volume measurement.

Materials: 8 1/2" x 11" paper, beans

Directions:
(1) Give each student two 8 1/2" x 11" sheets of paper.
(2) Instruct them to roll each one into a cylinder which measures 2" across. One cylinder should be rolled the length of the paper and the other rolled the width of the paper.
(3) Ask the following questions: Will each container hold the same amount? Why or why not?
(4) Let students fill the cylinders with beans to see if both hold the same amount to verify their answers to Step 3.
(5) Ask: What would happen if two square pieces of paper were rolled into cylinders and then filled?

105. WOULD YOU RATHER CARRY A GALLON BUCKET FILLED WITH SAND OR FILLED WITH PAPER?

Objective: Know and use basic facts of English measurement.

Materials: Balance scales, tin can (place mark on side at 250 ml), box of sand, box of paper shreds, water, brick, large ball of cotton, wooden block, rock, record sheet (see below)

Directions:

(1) Let students fill the can up to the mark with sand. Explain that the mark measures 250-ml when filled to the mark. Weigh the can of sand and write the weight on the record sheet.

(2) Let students divide the weight of the sand by the volume (250 ml) to find the density of the sand. Students should empty the sand and fill the can to the mark with shredded paper. Students must weigh the can of paper and write the weight on the record sheet. Let students divide the weight of the paper by the volume (250 ml) to find the density of paper.

(3) After the paper is emptied, students should fill the can to the mark with water. Let students weigh the can of water and write the weight on the record sheet. Let students divide the weight of the water by the volume to find the density.

(4) Instruct students to weigh the large ball of cotton and record the weight. The volume of cotton should be given on the record sheet. Students can divide the weight by the volume to find density.

(5) Students can weigh the block of wood and record the weight. The volume of the block should be given. They can divide the weight by the volume to find the density.

(6) Let students weigh the brick and record the weight on the record sheet. They can divide the weight by the volume (given) to find the density.

(7) Students can weigh the rock and record the weight on the record sheet. They can divide the weight by the volume (given) to find the density.

(8) Pose the question: Are large objects always heavier than small objects?

RECORD SHEET

A. Weight of equal amounts of different substances.

Substance	Weight	Volume	Density (wt./vol.)
sand	_____	_____	_____
paper	_____	_____	_____
water	_____	_____	_____

heaviest substance_____

B. Weight of large and small objects.

Object	Weight	Volume	Density (wt./vol.)
ball of cotton	_____	given*	_____
block of wood	_____	given*	_____
brick	_____	given*	_____
rock	_____	given*	_____

heaviest object_____

*Teacher must determine this before starting this activity.

106. TIN CAN TALLY

Objective: Determine area of curved surface by use of rectangle.

Materials: Tin cans of many sizes

Directions:
(1) Encourage students to bring empty tin cans from home so that an assortment is available. (Be sure to tell them not to bring cans with sharp edges.)
(2) Let students investigate the areas of the curve surfaces of the various cans.
(3) After students examine the cans, illicit comments from them about their observations.
(4) Ask the question: Do taller cans have larger areas?

107. PACE MAKERS

Objective: Estimate linear measurement.

Materials: Measuring sticks

Directions:
(1) Let each student estimate the length of his walking pace.
(2) After guessing what the length of his walking pace would be, the student should measure to find the actual length of his walking pace.
(3) Students should be able to estimate the length and width of the class room using the knowledge gained in Steps One and Two above.
(4) Have students to measure the actual length and width of the room to verify estimations.

108. HOW BIG ARE YOUR STEPS?

Objective: Estimate linear measurement.

Materials: Measuring tape

Directions:

(1) Let students walk at a normal pace between two marks on the floor and count the number of steps between. Students should do this three times to determine what the average number of steps between the two marks. Each student should record this average.

(2) Students should measure the actual distance between the two marks and compute the length of their average pace. This should also be recorded.

(3) Students can use the information obtained in Step Two to determine a comfortable walking pace for themselves (per minutes). They can also compute their comfortable walking rate in miles per hour.

(4) Each student should share with the class the following information about himself:

My number of steps per minute is_____.
My walking rate (in feet per minute is)_____.
My walking rate (in feet per hour) is _____.
My walking rate (in miles per hour) is _____.

(5) Determine who would be able to walk a mile in the shortest length of time.

(6) A chart could be developed to show where each student would be at the end of 30 minutes and at the end of 60 minutes.

109. THROUGH THICK AND THIN

Objective: Estimate linear measurement.

Materials: Paper and string

Directions:

(1) Let two students try to find the thickness of a piece of paper or a piece of string.

(2) Hint:
Students may want to calculate the width of 100 pieces of paper and then divide by 100. They can attach the string measurement in the same manner.

110. CUBITS

Objective: Know and use basic facts of standard measurement.

Materials: Measuring tape.

Directions:
(1) Students should measure the length from their elbow to the middle finger tip.
(2) Students who have the same (or nearly the same) measurement should stand side by side to let the class observe their heights. Are they the same height?
(3) Encourage observations and comments about this activity after each group of students stand together.

111. GOING ROUND IN CIRCLES

Objective: Determine the circumference, radius and diameter of a circle.

Materials: Measuring tape, 5 round objects (ball, can, quarter, paper circles, etc.), index cards

Directions:
(1) Provide 5 round objects for students to measure the circumference, diameter, and radius.
(2) Record the measurements for each object on an index card. On the opposite side of the card, write the name of the object.
(3) The objects and recorded information should be placed on a table.
(4) Have students try to match the recorded dimensions with the objects on the table. As they select a card to match an object, they can check the back of the card to check whether or not they are correct.

112. KEEP ON TRUCKING

Objective: Determine speed of walking.

Materials: Stop watch, tape measure

Directions:
(1) Measure a distance of 10 meters on the playground, track or sidewalk.
(2) Let each student walk as quickly as he can the 10 meters.
(3) Record the time each student takes to walk the measured distance.
(4) Make a chart of the students in the class and their walking speeds from fastest to slowest.

Discuss the following questions:
(a) Does leg length affect pace of walking?
(b) Does length of pace affect speed?
(c) Do girls seem to walk slower than boys?

113. METRIC MADNESS

Objective: Know and use basic facts of metric measurement.

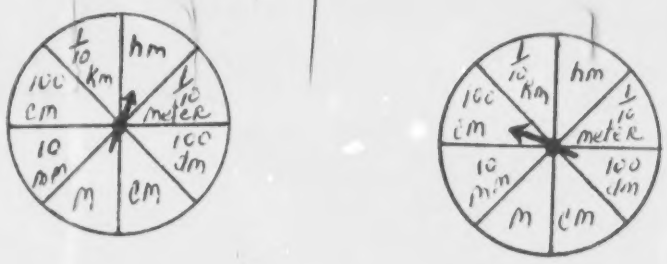
Materials: 10 one digit numeral cards, 10 cards naming metric units (meter, decimeter, etc.), 10 symbol cards ($<$, $>$, $=$, $+$, $-$, $\times$, $\div$, etc.)

Directions:
(1) Shuffle all cards together.
(2) The player on the dealer's right starts by placing a numeral card if he has one. If he does not have one, he passes.
(3) The second player must play a metric unit card.
(4) The next player must play a symbol card.
(5) A numeral card should be played next.
(6) The play continues in the same sequence. If a player does not have the type of card which is in sequence, he loses his turn.
(7) There is no limit to the length of the expression as long as it is correct. When no one can play a card on the number sentence, then a new sentence is started.
(8) If a sentence can not be completed the cards for that sentence must be shuffled and dealt again.
(9) At the end of play, the student with the least number of cards is the winner.

114. METRIC SPINS

Objective: Know and use basic facts of metric measurement.

Materials: Two cardboard circular regions with a spinner attached. Each should be divided with an equal number of sections. In each section place examples of metric units.

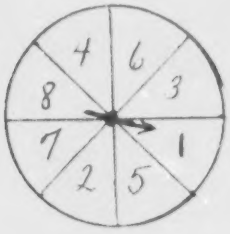


Directions:
(1) Divide the class into 2 teams.
(2) Give each team a spinner.
(3) Each team spins the spinner and determines if the measure on their spinner is larger than that measure on the other team's spinner.
(4) One point is given to the team with the largest metric measure.
(5) The team with the most points wins after a predetermined number of spins.

115. SPIN A SUM

Objective: Understand addition of metric units.

Materials: 4 spinners (2 of each drawn below). Mark each of them as shown.



Directions:

(1) Divide the class into two teams.
(2) Give each team a set of spinners.
(3) One person on each team spins both spinners and writes this number on the board in a section reserved for his team.
(4) The next person on each team should spin both spinners and write the number under the one previously recorded.
(5) All members of each team race to find the sum of the numbers on the board. The team who writes the correct answer on the board first wins a point.
(6) After a predetermined number of spins or time period, the team with the most points wins.

116. DESIGNING WALLPAPER

Objective: Design and construct geometric patterns.

Materials: Wallpaper samples, paint, ruler, large sheets of paper in light colors.

Directions:
(1) After studying geometric shapes and patterns, encourage students to create their own pattern.
(2) Once each student has designed his own pattern, let him fill a large sheet of paper with others like it but of varying sizes and colors.

117. GEOMETRIC SHAPES

Objective: Learn characteristics of geometric figures.

Materials: Various colors of construction paper, glue, scissors, pencils, rulers.

Directions:
(1) Instruct students to cut out a variety of shapes in many different sizes and colors.
(2) They can move the pieces around until a clown, person, animals, or any other object or scene is formed.
(3) Students can then paste the pieces on a large sheet of construction paper.
(4) They should be able to identify circles, squares, triangles, and rectangles in their picture when it is finished.

118. GEOMETRIC PEOPLE (HALLOWEEN WITCHES OR THANKSGIVING PILGRIMS)

Objective: Learn characteristics of geometric shapes.

Materials: 12" x 18" black construction paper, 9" x 12" orange construction paper, 4 1/2" x 6" yellow construction paper, 10" circle, glue, staples or tape.

Directions:
(1) Students should cut out 1/4 of the 10" circle. They can then fold the remainder of the circle into a cone and glue or staple it together.
(2) From a smaller circle, cut a 2 1/2" circle in the center so it can be slipped over the cone for hat brim.
(3) Cut 7" black strips for arms, insert in slots on each side of cone below hat.
(4) Use orange paper to make witch's hair. Make hands from orange or from yellow.
(5) Shape a broom and handle of orange paper and lean against the witch's hand. Scraps of paper can be cut into geometric shapes to give expression to the faces.

118. GEOMETRIC PEOPLE (Continued)

In November, Pilgrims can be made with gray paper. The shape of the hats should not be so pointed. Cover wrists with white cuffs. Put a buckle on the Pilgrim's hat. Attach small cylinders inside the cone for trouser legs. Make a gun for the pilgrim to hold. The women need an apron, a collar, and a bonnet.

119. EXPLODED SHAPES

Objective: Understand fractional parts of geometric shapes.

Materials: Construction paper, scissors and glue

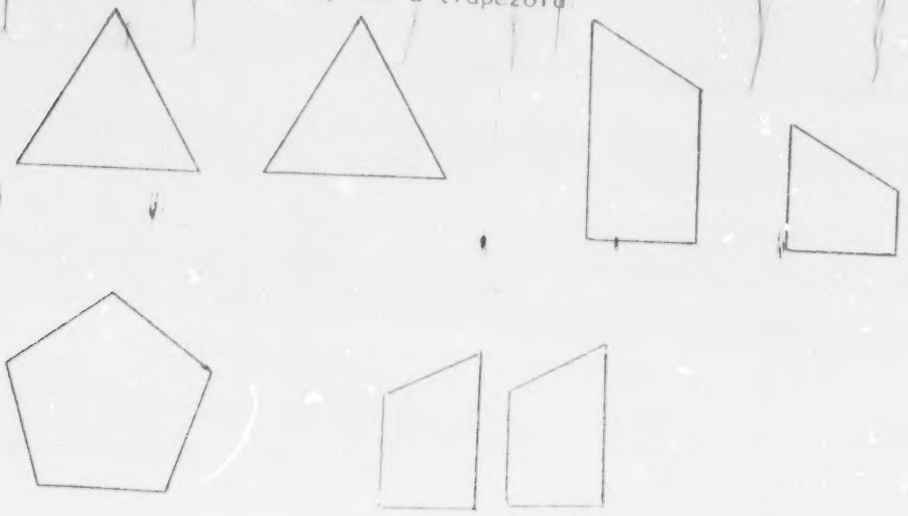
Directions:
(1) Ask each student to draw a geometric shape (square, rectangle, pentagon, etc.) and cut it out.
(2) Each student should cut their figure into many pieces.
(3) Let the student then reproduce the original design in a larger size on a contrasting sheet of paper.
(4) The smaller pieces of the original design should be glued inside the larger shape.
(5) Completed designs should be labeled and displayed.

120. POLYGRAMS

Objective: Identify and construct geometric designs.

Materials: The diagrams below should be duplicated for each student, scissors

Directions:
(1) Distribute a copy of the designs below to each student.
(2) Instruct them to use all the pieces to make a rectangle, parallelogram, cross, and a trapezoid



121. BOX SCORE

Objective: Differentiate between squares and rectangles.

Materials: Copies of the 4" x 4" square below

Directions:
(1) Make enough copies of the 4" x 4" square below so that each student has a copy.
(2) Each student is to locate as many different squares or rectangles as they can.
(3) Encourage students to look beyond the obvious in finding the two shapes.

122. TRIANGLE PUZZLER

Objective: Recognize equilateral triangles.

Materials: 6 toothpicks for each class member

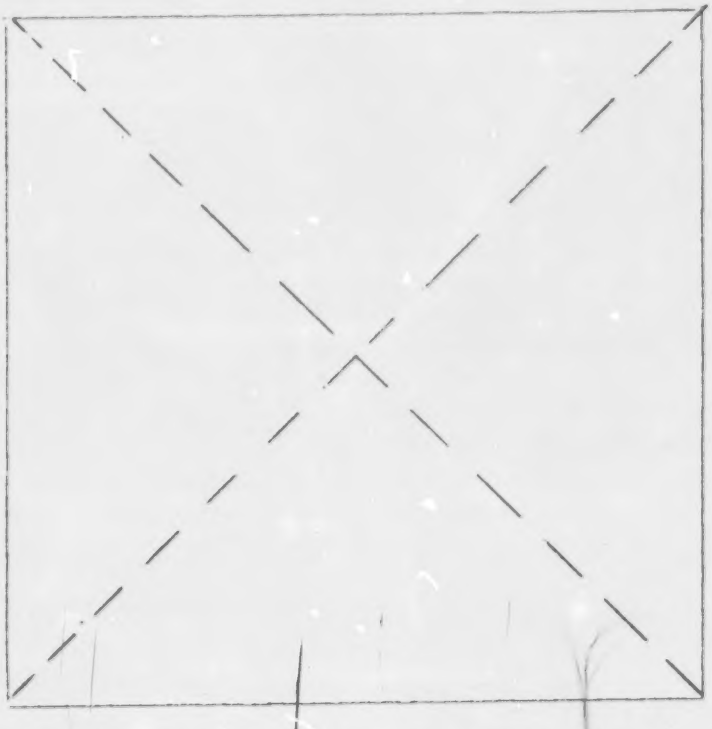
Directions:
(1) Distribute 6 toothpicks to each student.
(2) Instruct students to form equilateral triangles.
(3) The first student to form four equilateral triangles is the winner. He can then help others form their triangles.

123. PAPER CATERPILLAR

Objective: Identify and construct geometric shapes (triangles and squares)

Materials: Construction paper, ruler, 12-inch pipe cleaners, scissors, glue

Directions:
(1) Fold a 4" square as shown below and cut on the dotted lines.



(2) Students can continue to make triangles from the 4 large triangles in order to make a longer caterpillar.
(3) Students should run a 12" pipe cleaner through the center of each triangle.
(4) Paper eyes, nose, mouth and antennas can be pasted on the face of the caterpillar.

124. SNOWFLAKES

Objective: Identify and construct hexagons.

Materials: Compass, chalkboard, erasers, 10" x10" piece of thick cardboard, construction paper

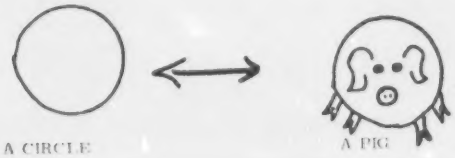
Directions:
(1) Let students make a perforated pattern on the thick cardboard by drawing a six-pointed hexagon with a compass.
(2) By dusting and rubbing a chalkboard eraser over the perforated holes, students can use the resulting dots as guides to draw identical hexagonal designs on the construction paper.

125. LET'S DRAW GEOMETRIC ANIMALS

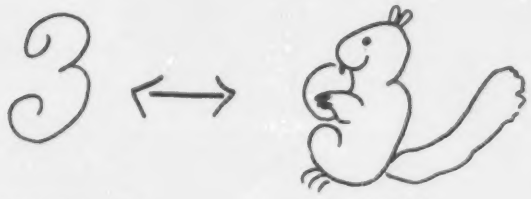
Objective: Construct and name geometric figures.

Materials: Compass, ruler

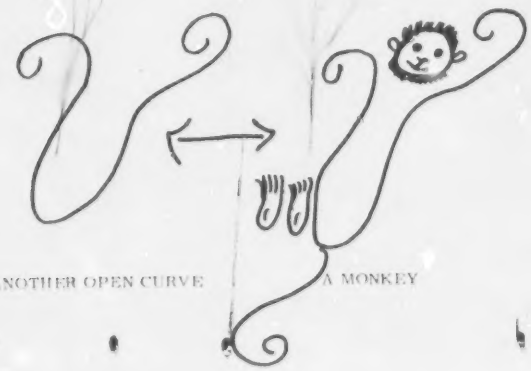
Directions:
(1) Provide the drawings below as examples of using geometric figures to draw an animal.
(2) Students can practice copying the figures provided.
(3) Students should create at least 10 geometric animals of their own design.
(4) Drawings can be shared with other students to see if they can find the geometric figure hidden in each animal.



A CIRCLE A PIG



AN OPEN CURVE A SQUIRREL



ANOTHER OPEN CURVE A MONKEY

126. PICTURE GRAPHING

Objective: Understand the coordinate system.

Materials: 3 pieces of graph paper per student

Directions:
(1) Give each student 3 pieces of graph paper.
(2) Give each student a copy of the points to graph for each picture.
(3) After students complete each picture graph let them answer the question following it.
(4) Display the picture graphs in the classroom.

Picture Graph #1

The horizontal and vertical axes should be drawn lightly. Plot the points correctly and connect them in order by line segments.

1.	(-1,12)	29.	(-5,-2)	57.	(4,-12)	85.	(3,13)
2.	(-2,13)	30.	(-7,-2)	58.	(5,-11)	86.	(4,13)
3.	(-1,13)	31.	(-9,-4)	59.	(4,-9)	87.	(6,15)
4.	(0,12)	32.	(-9,-1)	60.	(4,-4)	88.	(6,19)
5.	(1,12)	33.	(-2,6)	61.	(3 -2)	89.	(5,15)
6.	(2,13)	34.	(-2,-2)	62.	(3,6)	90.	(5,19)
7.	(3,13)	35.	(3,-2)	63.	(10,-1)	91.	(1,20)
8.	(2,12)	36.	(3,-1)	64.	(10,-4)	92.	(0,20)
9.	(1,10)	37.	(-2,-1)	65.	(8,-2)	93.	(0.17)
10.	(0,10)	38.	(-2,-2)	66.	(6,-2)	94.	(-2,16)
11.	(-1,12)	39.	(-3,-4)	67.	(6,3)	95.	(0,16)
12.	(-2,10)	40.	(-3,-9)	68.	(8,-3)	96.	(0,15)
13.	(-11,1)	41.	(-4,-11)	69.	(10,-5)	97.	(1,15)
14.	(-11,-9)	42.	(-3,-12)	70.	(7,-8)	98.	(1,16)
15.	(-10,-9)	43.	(-3,-16)	71.	(7,-9)	99.	(3,16)
16.	(-10,-6)	44.	(-5,-18)	72.	(8,-9)	100.	(1,17)
17.	(-9,-8)	45.	(-7,-18)	73.	(8,-8)	101.	(1,20)
18.	(-9,-10)	46.	(-8,-19)	74.	(10,-6)	102.	(0,20)
19.	(-8,-10)	47.	(-8,-20)	75.	(9,-8)	103.	(-4,19)
20.	(-8,-8)	48.	(0, -20)	76.	(9,-10)	104.	(-4,15)
21.	(-9,-6)	49.	(0,-5)	77.	(10,-10)	105.	(-5,19)
22.	(-7,-8)	50.	(1,-5)	78.	(10,-8)	106.	(-5,15)
23.	(-7,-9)	51.	(1,-20)	79.	(11,-6)	107.	(-3,13)
24.	(-6,-8)	52.	(9,-20)	80.	(11,-9)	108.	(-1,13)
25.	(-6,-8)	53.	(9,-19)	81.	(12,-9)	109.	(0,14)
26.	(-9,-3)	54.	(8,-18)	82.	(12,1)	110.	(1,14)
27.	(-7,-3)	55.	(6,-18)	83	(3,10)	111.	(2,13)
28.	(-5,-3)	56.	(4,-16)	84.	(2,12)		

Describe your picture._____

126. PICTURE GRAPHING (Continued)

Picture Graph #2

1. (-4,17)
2. (0,11)
3. (7,11)
4. (3,8)
5. (4,7)
6. (4,4)
7. (3,3)
8. (-3,3)
9. (-7,0)
10. (-7,-7)
11. (-5,-7)
12. (-5,-2)
13. (5,-2)
14. (5,-7)
15. (7,-7)
16. (7,0)
17. (3,3)
18. (7,0)
19. (-7,0)
20. (-7,11)
21. (-3,8)
22. (-4,7)
23. (-4,4)
24. (-3,3)
25. (3,3)
26. ε,0)
27. (7,11)
28. (3,8)
29. (-3,8)
30. (-7,11)
31. (0,11)
32. (4,17)

Describe your picture:_____

Picture Graph #3 (All 3 of these picture graphs can be placed on one sheet of graph paper.)

A.
(-16,-7), (-18,-9), (-20,-15), (-10,-17), (14,-16), (-10,-15), (-14,-15), (-12,-13), (-8,-16), (-6,-16), (-7,-15), (-6,-14), (-8,-14), (-10,-10), (-8,-8), (-6,-7), (-8,-7), (-6,-6), (-9,-3).

What animal have you drawn?_____

B.
(9,15), (9,13), (3,19), (5,19), (9,15), (9,20), (11,19), (11,15), (9,13), (9,1), (8,3), (7,2) (9,1), (17,1), (15,3), (14,3), (12,7), (14,7), (16,9), (11,9), (11,10), (13,10), (15, 12), (12,14), (11,14).

What animal have you drawn ?_____

C.
(7,-6), (8,-8), (11,-5), (11,-4), (10,-3), (13,-3), (18,-5), (20,-9). (21,-12), (20,-11), (19,-14), (21,-17), (18,-17), (18,-16), (17,-17), (14,-17), (15,-14), (10,-14), (9,-15), (10,-17), (7,-17), (5,-17), (6,-15), (7,-13), (7,-11), (8,-11), (6,-12), (5,-13), (3,-12), (1,-6) (3,-3), (4,-2), (7,-3), (8,-2), (10,-3).

Now draw lines from the point (6,-15) to the point for (7,-17). Connect the poitns (15,-14), and (18,-16). Draw a dot at the point (4,-6).

What is the animal you have drawn?_____

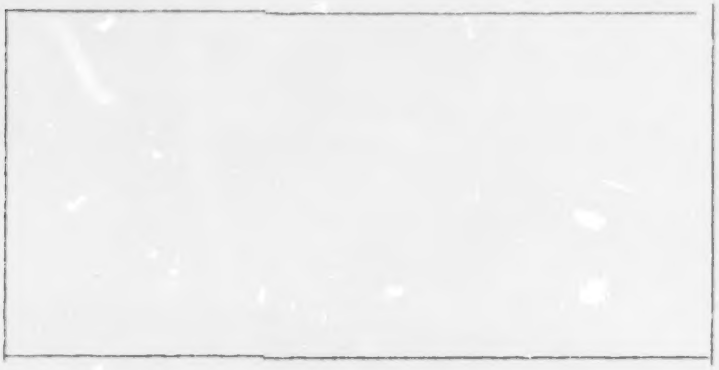
127. COUNTING CHIPS

Objective: Construct graphs to represent sets.

Materials: Colored counting chips, masking tape, crayons, graph paper

Directions:

(1) Each student should select, without consideration for color, as many counting chips as it takes to cover a 2" x 4" region.



(2) After students have selected counting chips, they should choose a partner and graph the combined set of chips.

(3) As pairs of students finish graphing their sets they can join other students to construct a graph which shows the color distribution for the combined set of all pairs involved.

(4) Encourage discussion of the activity by asking the following questions:

What is the purpose of the baseline?
Could the activity have be done without graph paper?
Can questions such as how many, most, least, more than, or less than be answered without using numbers? How?

128. BASE FIVE CALENDARS

Objective: Understand base five.

Materials: Magic markers, colored construction paper, white paper, rulers, glue, scissors.

Directions:
(1) Let students make a Base 5 calendar for each month of the year.
(2) Post the Base 5 calendar beside the Gregarian calendar.
(3) Let students make observations about both calendars.

129. BASE STICKS

Objective: Understand base five.

Materials: 5 boxes of toothpicks in different colors, paper bag

Directions:
(1) Explain to students that each color has a value. For example:

5 natural = 1 blue
5 blue = 1 yellow
5 yellow = 1 red
5 red = 1 green

(2) Each student will carefully reach into the paper bag where the tooth picks have been placed to pull out a specified number of toothpicks and group according to color.
(3) Place values where 5 or more of a color exist should be substituted in order to make all possible exchanges.
(4) The student with the largest value can be declared the winner.

130. THE BASE EIGHT SYSTEM

Objective: Use base 8.

Materials: Boxes and small objects (sticks, small blocks, beans)

Directions:

(1) Refresh students' memory of base 8 by using the following:

15_{ten}

17_{eight}

30_{five}

(2) Let students pick up 35 sticks and place them in boxes by 8's. There should be 8 sticks in 4 boxes and 3 left over. In Base 8 language this would be 43_{eight}.

(3) Counting in Base 8, let students write the answers to the following:

9 = _____

15 = _____

16 = _____

25 = _____

47 = _____

(4) Provide other examples to extend the activity.

131. BINARY COMPUTERS

Objective: Convert base 10 to base 2.

Materials: None.

Directions:

(1) Use only 0 and 1 in the binary system of numerals.

(2) Place values in the binary system are given by the powers and the binary system.

	TENS	BINARY
0 =	$(\underline{0} \times 1)$	0
1 =	$(\underline{1} \times 1)$	1
2 =	$(\underline{1} \times 2^1) + (\underline{0} \times 1)$	10
3 =	$(\underline{1} \times 2^1) + (\underline{1} \times 1)$	11
4 =	$(\underline{1} \times 2^2) + (\underline{0} \times 2^1) + (\underline{0} \times 1)$	100
5 =	$(\underline{1} \times 2^2) + (\underline{0} \times 2^1) + (\underline{1} \times 1)$	101
6 =	$(\underline{1} \times 2^2) + (\underline{1} \times 2^1) + (\underline{0} \times 1)$	110
7 =	$(\underline{1} \times 2^2) + (\underline{1} \times 2^1) + (\underline{1} \times 1)$	111
8 =	$(\underline{1} \times 2^3) + (\underline{0} \times 2^2) + (\underline{0} \times 2^1) + (\underline{0} \times 1)$	1000

(3) The students may work in pairs to test their understanding of the binary system.

(4) The students should decode the following message in binary. The letters of the alphabet are numbered 1-26. The numbers are then converted to binary and codes are established. For example:

11	1	10100	= cat

11	1111	100	101	10011		1	10010	101		101	1	10011	11001

10100	1111		10010	101	1	100		1001	110

11001	1111	10101		1011	1110	1111	10111		10100	1000	101

1011	101	11	10010	101	10100

Answer: Codes are easy to read if you know the secret.

(5) Encourage students to write their own coded messages.

(6) Exchange coded messages with other students.

132. COUNTING WITH YOUR FINGERS AND TOES

Objective: Understand base 20.

Materials: Chart of Mayan number system (see below)

Directions:

(1) The following introductory remarks should be made to students:

The place value system used today is the Hindu-Arabic system. But centuries ago when the system was being developed, the Mayan system was being used in the New World.

The Mayas lived in what is now Central America. Their numeration system was based on 20. Can you guess why they probably used twenty? (10 fingers and 10 toes)

The Mayas system was a place-value system that used the symbol for zero. Study the chart to discover the system for naming numbers.

(2) As students study the chart let them discuss the following questions:

(a) What number is named by two dots in the ones place? (2)
(b) What number is named by two bars in the ones place? (10)
(c) What number is named by 2 dots in the twenties place and two bars in the ones place? (50)
(d) What number is named by two bars in the twenties place and three dots in the ones place? (203)
(e) What numbers are named by the following?

(3) The Mayas were interested in Astronomy. They made calendars based on the motion of the sun and other stars. The Mayas used 360 for the value of the third place in their numeration system. This is probably because there are about 360 days in a year.

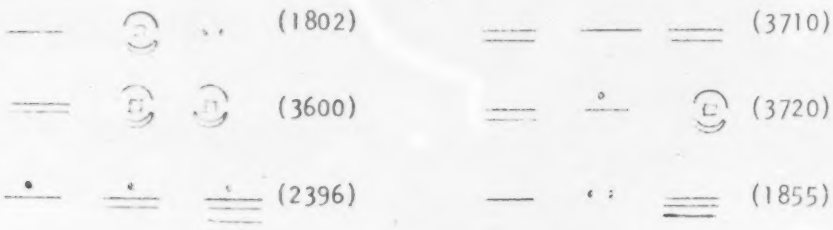
names 360. = (1 x 360) + (0 x 20) + (0 x 1)

Three hundred sixties	twenties	ones
•		

(4) What number does the following three-place numeral name?

			3822
(10 x 360) +	(11 x 20) +	(2)	3822

(5) What numbers are named by the following Mayan numerals?



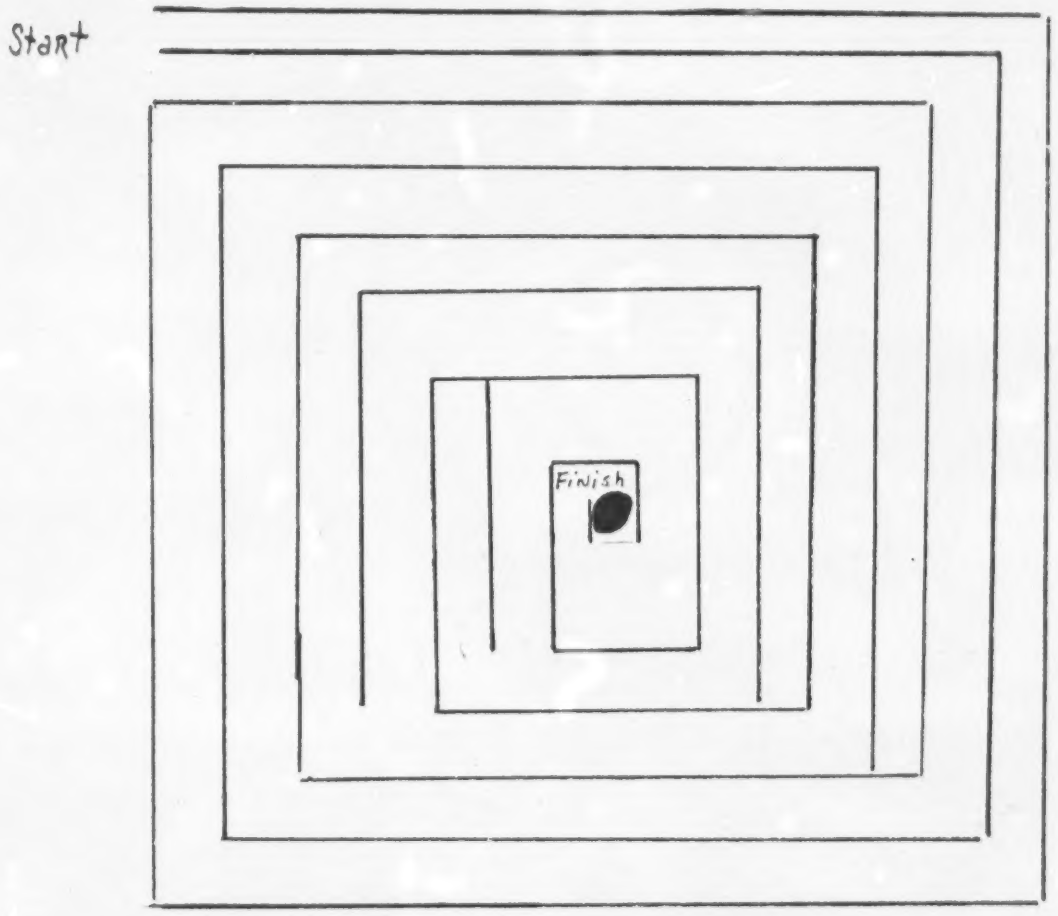
NUMBER SYSTEMS		
	Mayan	
Hindu-Arabic	Twenties	Ones
0		
1		
2		
3		
4		
5		
8		
9		
10		
11		
12		
15		
19		
20		
30		
50		
100		
150		
300		

133. EASTER MAZE

Objective: Understand and create mazes.

Materials: None

Directions:
(1) Explain what a maze is to students. Make a copy of the one below or find one which students can use.
(2) Let students create their own mazes.



134. SNATCH

Objective: Improve logical reasoning powers.

Materials: 2" x 2" squares of paper

Directions:
(1) Give a small group of students a group of 2" x 2" paper squares.
(2) The first player must arrange any number of squares into 3 rows.
(3) The next player removes any number of squares from one row. He may take only one square or the entire row but he must take at least one square.
(4) Players continue to remove squares until the last square is taken. The one who takes the last square is the loser.

135. THINK ABOUT IT

Objective: Improve logical reasoning powers.

Materials: Copies of the two stories below for each student

Directions:
(1) Give each student a copy of the two stories below.
(2) Let students discuss possible answers or write their ideas on paper.
(3) After reading the last story, encourage students to make up a "more or less" problem to share with the class.

A. The Bad Omen

The night watchman timidly entered the office door. He had never spoken to the president of the firm before. When the president saw him he said, "Well, my good man, what can I do for you today?

"Excuse me, sir," he said. I know you are busy. But this is very important. I know you are planning to fly to Chicago, but don't. Take the train instead."

The president was surprised and said, "That's a rather strange thing to ask. Why shouldn't I fly?"

"Well, you see, sir. Last night I had a dream that the plane to Chicago crashed and everyone was killed."

The president smiled and said, "Thanks for telling me."

In spite of the warning the president flew to Chicago. The plane arrived safely, and on Monday he flew back to New York. As soon as he stepped into his office he ordered that the night watchman be fired. Why did he fire him?

B. The Census

The census taker counting the people of a backwoods town, was questioning the bearded owner of a tumbledown shack. He pointed to another scraggle man who lay fast asleep, propped up against a tree. "Who is he?" he asked. The man replied, "Brothers and sisters have I none, but that man's father is my father's son." Who is the sleeping man.

136. A MAN WITH A DEEP PROBLEM

Objective: Understand basic addition and subtraction facts.

Materials: None

Directions:
(1) Ask students to think about the following problem and figure what the answer would be.

A man was stuck in the bottom of a well and tried to climb out. Every day he climbs 3 feet, but at dusk he fell back 2 feet. If the well was 23 feet deep, how long did it take for him to climb out?

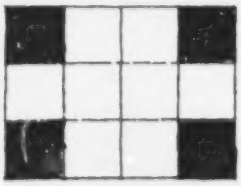
(2) Let students compare their answers.
(3) Demonstrate on the chalkboard how the problem might have been solved.

137. NUMBER FILL IN

Objective: Improve logical reasoning powers.

Materials: Copy of the diagram below for participating students.

Directions:
(1) Distribute diagrams (as shown below) to participating students.
(2) Explain to student that they are to fill in the squares with all numbers from 8-16 so that two consecutive numbers are never adjacent vertically, horizontally, or diagonally.
(3) Let students who are successful help other students by providing some, but not all, answers.



138. OWARE

Objective: Improve logical reasoning skills.

Materials: Egg cartons, dried beans or small stones (egg cartons are the game boards, beans are the playing pieces.)

Directions:

(1) Two players play together with the object being to see which one can accumulate the most beans.
(2) The egg carton should be placed between the two players. Each student places as many, or as few, beans in his six "cups" as he wishes.
(3) After both players have placed beans in each "cup" on his side, play can begin.
(4) The first player picks up all the beans from one of his cups and places one in each cup around the board to his right. If a cup the player chooses contains twelve or more beans, the original cup does not get a bean when the player reaches it. If the last bean of a player's turn drops into a cup on the opponent's side making the final count 2 or 3, these beans are captured.
(5) When an opponent's cups are empty, a player must, if possible, make a move which gives the opponent beans to use. If a player omits to do so, he forfeits all of his beans to his opponent. If it is impossible to make such a move, the game is over and all the beans left on the board go to each player's pile.
(6) When no more captures are possible, each player adds the beans left in his own cups to his pile.
(7) The winner is the player with the greatest number of beans.

139. TEN BEANS IN FIVE ROWS

Objective: Improve logical reasoning powers.

Materials: 10 dried beans for each student.

Directions:
(1) Direct each student to place his dried beans on top of the table (desk, etc.).
(2) The first student who can arrange the ten beans in five rows with four beans in each row is the winner.

140. TOOTHPICK TRICKS

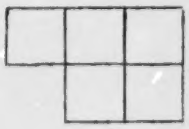
Objective: Improve logical reasoning skills.

Materials: Several boxes of toothpicks

Directions:
(1) Let each student try to solve the problems presented below by using toothpicks to help.
   (a) Look at the following equation. Take away two toothpicks to make it a true equation.

VII - I = I

   (b) Take 9 toothpicks and make 10 out of them.
   (c) Remove 3 toothpicks from the 5 squares below so that there are 3 squares remaining.



   (d) Find 8 toothpicks. Take away 3 so that there are still 8 left.
(2) Allow the students who solved the problems to explain to the class how they did it.

141. POPULATION PROBABILITY

Objective: Calculate probabilities through sampling procedures.

Materials: Twenty 1" heavy cardboard squares (10 black and 10 red), small box

Directions:

(1) Two players are needed for this activity.
(2) Player A places any 10 squares from the total of 20 in the box while Player B closes his eyes.
(3) Player A mixes the ten cards in the box well before letting Player B draw 4 squares from the box.
(4) Player B, after recording his sample, should replace the 4 cards and draw again after the cards are mixed well. This process continues until Player B has recorded 6 samples drawn from the box.
(5) Judging from the samples drawn, Player B should be able to guess how many red and black cards are in the box. If he is correct he receives one point.
(6) Player B should exchange places with Player A so that Player A has a chance to score a point.
(7) After each player has had 5 turns the scores should be totaled. The player with the largest score is the winner.

142. PAPER CUP PROBABILITY

Objective: Estimate probability.

Materials: One paper cup per student, rug samples (if possible to lessen the noise)

Directions:

(1) Let each student toss a paper cup to discover which way it is most likely to land.

(2) Students should toss their cups for a total of 20 tosses and record how it lands each time.

Cup lands	✓each time cup lands this way	total number of ✓	P
Top up			/20
Bottom up			/20
Side			/20

(3) Explain to students that the total times the cup landed "up" in 20 tosses is the probability of that event. For example, if a cup landed "up" 3 times out of 20 tosses, the P (top up) = 3/20.

(4) Combine totals for 5 students to figure the probabilities of combined tosses. Use the following chart to record the data.

Way cup lands	Total times for each person					Total	P
"Top up"							/100
"Bottom up"							/100
"Side"							/100

143. BOTTLECAP PROBABILITY

Objective: Estimate probability.

Materials: 10 bottlecaps per student, 15 poker chips per student, (5 red, 5 white, 5 blue), one small paper bag per student, rug samples (if available, will lessen when bottle caps are flipped), chart (see below)

Directions:

(1) Each student should place 10 caps in a bag, shake it quietly, and dump the caps on the rug.

(2) He must count how many caps are "open end up" and "open end down," and record the numbers on a copy of the chart below. Find P (open end up) and P (open end down) like you did before.

(3) Each student should flip the caps out of the bag 10 times. This means they have tossed 100 caps. Results of each flip should be recorded.

Way lands	Times way happened										Total	P
Open end up												
Open end down												
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		

(4) Help students to discover how to find the probability (P) of a bottle cap landing in the "up" position and in the "down" position.

144. HEADS UP

Objective: Determine probability.

Materials: Dime, quarter, tape

Directions:
(1) Tape a dime and quarter together (tail to tail).
(2) Instruct the student to toss the taped coins 25 times. For each toss the student should record the results.
(3) Student should be able to estimate the probability of the dime landing on top after this activity.

145. MATCH UP

Objective: Determine probability.

Materials: 4 books of matches

Directions:
(1) Let students toss 4 books of matches into the air and fall on the floor 25 times.
(2) For each toss the students should record how the match books landed (scratch side up, scratch side down, edge).
(3) Students should estimate the probabilities for each position after the 25 tosses.

146. SEVEN UP

Objective: Determine probability.

Materials: 7-Up bottle caps

Directions:
(1) Instruct students to toss the bottle caps 100 times and keep a record of each toss.
(2) Each student should determine the probability of the open end being in the "up" position after the 100 tosses.
(3) Students can combine results and figure the probability of the open end being in the "up" position after several hundred tosses.

147. IF THE HAT FITS, WEAR IT!

Objective: Correlate math skills to various professions.

Materials: Construction paper, scissors, tape

Directions:
(1) Each student should make a hat to fit a profession.
(2) To wear his hat in class he must give 5 uses that he would have for math in that profession.

148. JUST CALL ME CAESAR

Objective: Locate number patterns.

Materials: None

Directions:
(1) Let students find or make a calendar with all 12 months on one sheet.
(2) Students are to study the calendars to find as many number patterns as they can.
(3) Students should record the number patterns they see.
(4) The student who finds the most number patterns is named "Caesar for the Day."

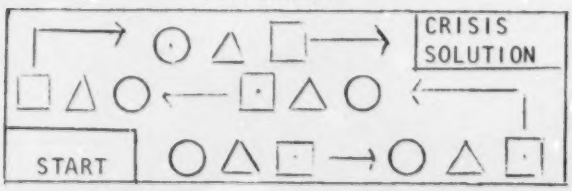
149. INTEGER CRISIS

Objective: Understand integer computation.

Materials: Gameboard (see below), one red die, one white die, teacher-made playing cards

Directions:
(1) Prepare the gameboard as follows on a piece of construction paper or poster board:

GAMEBOARD



(2) Cut enough 3" x 5" cards to use as playing cards. On each card give directions such as:

Compute -5 + -3 and take extra turn.	Gas Shortage Lose One Turn	Crisis solved. Move ahead three spaces.	Move to next block. Stop and pick up another card	Out of power. Lose a turn

(3) Let each player roll the dice. (The red die stands for a negative integer and the white die stands for a positive integer.
(4) The player's move is decided by the total on the dice. If the total is positive, he moves forward that amount. If the total is negative, he moves back that amount.
(5) If a player lands on a spot with a dot, he must draw a card and do what it says.
(6) The first person to reach the Crisis Solution is the winner.

150. STORE

Objective: Add and subtract money.

Materials: Play money, cash register, grocery items

Directions:
(1) Prepare a "store" in one corner of the classroom. Encourage students to bring grocery items (empty) from home which still have the labels and prices on them.
(2) Set up the cash register and give each student a certain amount of play money with which he can make purchases.
(3) Let students who are watching "check" the accuracy of the cashier. The cashier should call out the price of each item and total the items.
(4) The student making the purchase should tell those watching how much he plans to give the cashier. When his change is given to him, he should check to be sure that the cashier has not made a mistake.
(5) Give students written problems such as the following:
    (a) What is your change if purchases total $9.93 and you give the cashier a ten dollar bill?_____
    (b) What is your change if purchases total $54.18 and you give the cashier three twenty dollar bills?

151. LET'S GO SHOPPING

Objective: Add decimals.

Materials: Grocery ads from local newspaper

Directions:
(1) Give the grocery list (below) to each student.
(2) Instruct students to search the ads for local prices. They should select the cheapest price if more than one is found and place this price in the blank beside each item.
(3) Let students pretend that this is their weekly grocery list. They must total the amounts to determine how much the weekly grocery bill would be.

2 pounds hamburger _____
sugar (5 pounds)_____
1 loaf bread_____
1 bottle ketchup (32 oz.)_____
5 pounds green beans_____
2 pounds bacon_____
3 cans tuna_____
5 TV dinners_____
2 cans of pears_____
3 pounds chicken_____
margarine (2 pounds)_____
1 quart mayonaise_____
1 can shortening (3 lbs.)_____
1 bag potato chips_____
3 pounds bananas_____
1 pound coffee_____
6 cans of evaporated milk_____
1 head of lettuce_____
3 cans of peaches_____
Laundry detergent-84 ounces_____

152. WISE SHOPPER

Objective: Add and subtract decimal fractions through hundredths.

Materials: Newspapers

Directions:
(1) Let each student prepare a grocery list of 15 common items.
(2) Each student should search for the prices of the groceries on his list in newspaper advertisements. He should find the prices on each item from local two local stores.
(3) Explain to students that they must compare items which have equal weights and sizes.
(4) After completing his search the student can determine which store would save him the most money.

153. WATCH THAT MISTAKE

Objective: Practice computational skills.

Materials: Chalk and blackboard.

Directions:
(1) Divide the class into 2 equal teams.
(2) Write on the board as many arithmetic problems as there are students.
(3) On a signal, the first person on each team goes to the board and works one problem.
(4) Each team member follows the leader one at a time.
(5) If one team has mistakes on their side of the board, opposing team members who discover them and can correct them gain a point for their team.
(6) A point is scored for each correct problem and for each corrected problem on the opponent's side. The team with the most points after a predetermined time period is the winner.

154. IRS

Objective: Add and subtract decimal fractions through hundredths.

Materials: Old income tax forms

Directions:
(1) Distribute old income tax forms to students.
(2) Instruct students how to complete a tax form.
(3) Let each student pretend to have an income, expenses, etc. and fill out the tax form accordingly.
(4) Students should follow IRS instructions as closely as possible.

Optional:
(5) After all students complete the assignment, the tax forms should be given to a committee of students who serve as IRS agents to check the correctness of the returns. If there are obvious errors the person making the return should be given another chance.

155. CAB MATH

Objective: Compute fractions and per cent.

Materials: Cab driver's hat

Directions:
(1) Line up six chairs to represent the three spaces in the front seat and three spaces in the back seat of a cab. The cab driver sits in the driver's seat and wears the hat.
(2) Explain to students that the rate for a cab trip is 60 cents for the first 1/5 mile and 10 cents for each additional 1/5 mile.
(3) Ask students how much a 2 1/2 mile trip would cost. Fifteen cents should be added as a tip for the driver.
(4) The first "rider" to answer the problem exchanges seats with the driver and wears the driver's hat. This new driver makes up a new trip and tip.
(5) Until the new problem is unswered correctly, the driver remains in his seat. When it is answered correctly, he relinguishes his seat.